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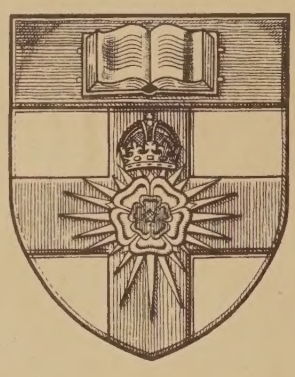

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ACCOUNTS AND PAPERS:

FORTY-SEVEN VOLUMES.

—(18.)—

EAST INDIES.

PUBLIC WORKS.

Session

4 *November* 1852 —— 20 *August* 1853.

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ACCOUNTS AND PAPERS:

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FORTY-SEVEN VOLUMES:—CONTENTS OF THE

EIGHTEENTH VOLUME.

N.B.—*THE* Figures at the beginning of the line, *correspond with the* N° *at the foot of each* Paper; *and the* Figures *at the* end of the line. *refer to the* MS. Paging *of the Volumes arranged for the House of Commons.*

EAST INDIES.

PUBLIC WORKS (BENGAL, &c.):

407. Copies of the Reports of the several Commissioners on Public Works at *Bengal, Madras* and *Bombay*, in the Year 1851–52, of the Minutes of the Members of the Government thereon, and of any Orders or Despatches of the Court of Directors relating thereto - - - - - - - - - - - - p. 1

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987. Further Return relative to Public Works in *Bengal, Madras* and *Bombay* - - - - - - - - - - - - 461

PUBLIC WORKS (BENGAL, &c.)

RETURN to an Order of the Honourable The House of Commons, dated 24 February 1853;—*for*,

COPIES "of the Reports of the several Commissioners on Public Works at *Bengal*, *Madras*, and *Bombay*, in the Year 1851-2, of the Minutes of the Members of the Government thereon, and of any Orders or Despatches of the Court of Directors relating thereto."

East India House,
26 April 1853.

James C. Melvill.

REPORT of a Commission for Inquiry into the Superintendence and Execution of Public Works in the *Bengal* Presidency.

Extract of General Order by the President in Council, No. 653, of 21st December 1850.

"The Honourable the President in Council, with the concurrence of the Most Noble the Governor-General, is pleased to appoint Major J. P. Kennedy, Consulting Engineer to Government, Major W. E. Baker, of Engineers, and Mr. C. Allen, Civil Service, to be a Commission for Inquiry into the system of Superintendence and Execution of Public Works in the Presidency of Bengal."

Preliminary.

The instructions intended for the guidance of the Commission constituted in the above-quoted General Order, were communicated in a letter, No. 585, of the 21st December 1850, from the officiating Secretary to Government Military Department, referring the Commission to a despatch, No. 2,* of 30th January 1850, from the Honourable Court of Directors of the East India Company, addressed to the Governor-General of India in Council.

Instructions furnished to the Commission.

2. "The Commissioners were further directed, after completion of their inquiry, to report its result," and, in so doing, "to submit for the consideration of the Government any suggestions which they may think it expedient to make, either for the modification and amendment of the present system, or for the establishment of some other plan, whereby the execution of the Public Works may be placed under such a system as shall ensure their being planned and executed with the utmost practicable amount of promptitude, skill, and true economy."

Reference to a despatch from the Honourable Court of Directors.

3. The despatch from the Honourable Court of Directors embraces several important questions connected with the Public Works in all the Presidencies of India (as enumerated in the margin),† and calls for a special Report on each and all of these subjects, together with suggestions as to the future management and control of the Department.

Steps taken by the Commission.

4. The Commission has endeavoured to obtain the fullest information available on such of the subjects mooted by the Honourable Court as are more or less connected with the Presidency of Bengal, and to these subjects they will revert in the latter part of the present Report.

Mode of inquiry.

5. They have also instituted a full inquiry into every branch of the present system of administration of Public Works, and, with this object in view, they have personally examined the Members and Secretaries of the Military Board, and such of

* *Vide* Return to the House of Commons, No. 622, of 1851, in which this despatch is printed at pp. 146 to 154.

† 1st, The Great Trunk Road. 2d, The Agra and Bombay Road. 3d, The District Roads of Madras. 4th, The Bombay Road and Tank Department. 5th, The separation for India and Bengal of the Civil Branch of Public Works from the duties of the Military Board. 6th, The education of young natives as Assistant Engineers.

of the Superintending Engineers and Executive Officers as were within convenient distance. They have also entered into correspondence with the Government of India and the Local Government of Bengal and Agra, with the more distant Superintending Engineers, and with the Principal of the Civil Engineering College at Roorkhi.

Reference to Evidence.

6. On the information thus procured, and which will be found either in detail or in an abstract form in the Appendices, they have generally based their Report; though at the same time, in weighing the evidence (sometimes of a conflicting nature) which has come before them, they have not hesitated to give effect to the convictions impressed on the individual members by their own experience in the conduct of Public Works.

General Plan of Inquiry and Report.

7. In the prosecution of these inquiries, the Commission have generally followed the plan detailed below, and which will also serve as an index to that part of their Report which relates to the present system of administration of Public Works; viz.—

First. To obtain a perfect knowledge of the existing system of superintendence and execution of Public Works.

Second. To ascertain what are the nature and extent of the practical evils, hindrances, and inconveniences which are felt under the present system by the different branches of the administration.

Third. To obtain from executive officers a statement of the nature and grounds of their objections to the present system, and a detail of the difficulties which they experience in carrying it out.

Fourth. To ascertain what portion of the admitted and alleged evils is attributable to the inherent vice of the present system, and what is due to the fault or negligence of those who have to carry it out, and to consider how far these evils may be remediable under the present arrangements.

Fifth. To lay down the principles upon which the control of Public Works should be exercised, and to arrange the details of an improved system.

Organization of the Department of Public Works.

Military Board. Province.

8. The Province of the Military Board is to control the Departments:—First, of Public Works. Second, of the Army Commissariat. Third, of the Government Studs. Fourth, of the Ordnance, which includes the Foundry, the Gun Carriage Agency, the Powder Mills, the Arsenals, and the Military Equipments of the Army, with the exception of Clothing.

Constitution.

9. The Military Board consists of four members, viz., the Chief Engineer, the Commandant of Artillery, the Commissary-General, and the Stipendiary Member; of these, the two first named are strictly *ex officio* members: the Commissary-General has no separate duties connected with the Commissariat, nor any control over that department, except as a member of the Military Board.

Subdivision of Departments.

10. Three members of the Board, viz., the Chief Engineer, the Commissary-General, and the Stipendiary Member, direct the superintendence and execution of all Public Works, and audit the accounts connected with them. They have an equal vote on all questions arising in the department. The Commandant of Artillery, the Commissary-General, and the Stipendiary Member, control the Commissariat, the Stud, and the Ordnance Department. The four members vote together only on questions connected with the constitution of the Board itself, and with the rules regarding its procedure.

Secretariat.

11. The Secretariat of the Military consists of a Secretary and two Assistants. The Secretary is responsible for and superintends all the business of the office, and lays before the Board all questions submitted for their consideration or orders; but the particular charge of one or more departments is entrusted to each officer.

Duties.

12. It is the province of the Military Board to advise Government on all questions connected with the Public Works, to economize the expenditure of public money,

money, to examine and check estimates and bills, and to exact from the officers and the departments a strict performance of the duties assigned to each.

13. The Military Board communicates with the Governor-General or President in Council regarding the military works throughout the Presidency, and with the Local Governments of Bengal and Agra, regarding the civil buildings and works of those Provinces respectively. Communication with Government.

14. The powers of the Military Board regarding audit of accounts have been regulated from time to time by instructions received from Government; but, in consequence of recent orders, they do not now pass any bills which, in their aggregate amount, or in the several items of detail, shall exceed the estimate previously sanctioned by Government. The Board may sanction estimates for ordinary repairs within the total amount granted annually by Government for that purpose. They have also the power of passing contingent bills, not exceeding (500) five hundred rupees. Powers of Audit.

15. The procedure of the Military is prescribed in certain printed regulations [*see* Appendix A.], which are not now strictly adhered to; the practice is as follows: a Board of the department of Public Works meets twice a week, when the less important subjects are laid before it by the Secretary, discussed *vivâ voce*, and, if the members are unanimous, are disposed of at once. Papers connected with more important subjects, or on which a difference of opinion has been elicited at the Board's meeting, also all estimates, bills, and progress reports, are circulated amongst the members, who record their opinions in separate minutes. A draft letter, combining those opinions, if possible, is then prepared and circulated, and, if approved, a letter of the same tenor is written and despatched. If, after repeated circulations, unanimity appears to be attainable, the proceedings, including the several minutes, are forwarded for the decision of Government: should a difference of opinion arise on a question referred by a subordinate authority, the majority may communicate their decision as that of the Board, but are bound to report the circumstance to Government, with a copy of the proceedings. Procedure.

16. There are five regular circles directed by Superintending Engineers, besides the Canal Department, in the North-Western Provinces, with its Director, the Grand Trunk Road, with its Superintendent, and the Iron Suspension Bridge Yard at Allipore. Superintending Engineers distribution.

17. The duties of a Superintending Engineer are defined in General Orders of the Governor-General, No. 235, of 1828, under which he is responsible for the efficiency of the executive system throughout his circle. He is required to make an annual tour of inspection, and to report annually on the various public buildings and works in progress within his superintendency, to inquire into the management of executive officers, and to direct them in professional details, and in employing the resources of the country to the best advantage. He is to examine and comment upon the progress reports sent to his office for transmission to the Military Board. Duties.

He is especially required to inspect the office books in each division, and to satisfy himself that the accounts are kept in the manner prescribed by regulation. Should he perceive any irregularity or deficiency, either in the arrangements for construction, or in the details of the office, he is bound to see it corrected before he leaves the spot. He is to make full reports of his proceedings to the Military Board, bringing to their notice any deficiency of skill or management, as well as all instances of extraordinary zeal and ability in the department of Public Works.

In forwarding estimates and bills, he is not required to check the calculations, but must examine the rates for labour and materials, and report especially on them for the information of the Military Board.

By late regulations, he may discharge any clerk in the executive engineer's office whom he may see unfit for his situation.

18. The circles of superintendency are subdivided into districts, called "First and Second Class Divisions of Public Works," each of which is entrusted to an executive officer, who is allowed assistants, European overseers, and native agents, in proportion to the extent and importance of the works under his charge. Executive Officers Distribution.

Duties.

19. The Executive Engineer has the care and maintenance of all military works, and such civil ones as are under the Board in his division, and the construction of all that may from time to time be required.

In military cantonments he performs the duties of barrack-master, having responsible charge of all barrack and hospital furniture, with that of the public buildings. Under instructions from competent authority, he prepares designs for all works required in his division, and frames estimates for them, as well as for annual repairs. After sanction has been obtained, he proceeds to the execution of the work, and arranges for the purchase or manufacture of materials and the provision of labour. He keeps all his accounts of expenditure according to a prescribed form, and, on completion of the work, prepares from these accounts a bill for the total amount expended. He is at liberty to apply to the Superintending Engineer for advice and assistance in all matters connected with his public duty; transmits to him periodical reports of progress, and is bound to report to him the occurrence of any circumstances which may cause a greater expenditure than that contemplated in the estimate.

Subordinate Agency.

20. The subordinate agency for superintendence of works consists of two regularly organized bodies of men, one military and the other civil; each is divided into four grades, and the promotion in each is regulated generally by seniority, but not strictly, or as matter of right.

Denomination.

21. The denomination of these officers is as follows:

If Military, *i. e.* Private Soldiers, or Non-Commissioned Officers.	If Civil, whether European, East Indian, Mahomedan, or Hindoos.
Conductors.	Supervisors.
Sub-Conductors.	Assistant Supervisors.
Overseers.	Overseers.
Assistant Overseers.	Assistant Overseers.

All individuals entering the department are first posted as Assistant Overseers, after passing an examination in arithmetic, mensuration, and plan drawing. Europeans are required to have a colloquial knowledge of Hindoostani.

Sub-Assistant Civil Engineer.

22. A new class, under the denomination of "Sub-Assistant Civil Engineer," was constituted in 1845, open to Europeans and natives, but demands high qualifications in mathematics, plan drawing, and surveying. This class is now recruited exclusively from the Roorkhi College.

Native Agents.

23. There are further native agents, and daroghas, mohurrurs or writers, head artificers, and chuprassies.

Office Establishment.

24. The office establishment for the preparation of accounts, bills, periodical papers, and for correspondence, consists generally of natives capable of writing English, Oordoo, and Bengalli; but in some divisions there is an European or East Indian accountant or head clerk. A clerk in an executive engineer's office cannot be discharged without the consent and permission of the Superintending Engineer. By recent orders of Government, an office establishment, at an aggregate monthly salary of (150) one hundred and fifty rupees, and (100) one hundred rupees respectively is allowed to each first and second class division, and when extra clerks are required for new works, they may, with the sanction of the Superintending Engineer, be entertained.

Execution of Public Works.

Estimates how ordered.

25. No Public Works, with exception of the most petty repairs, can be undertaken, unless on estimates previously sanctioned. A design and estimate for a new work may not be submitted by an executive officer, nor called for by a Superintending

Superintending Engineer, without the sanction of the Military Board, though either of these officers may represent the necessity for a work, and request permission to estimate for it.

Estimates, how prepared.

26. Designs for new works, called for by competent authority, are prepared by the executive officer, and forwarded for transmission to the Superintending Engineer, accompanied by explanatory drawings, and an estimate of cost. The estimate is drawn out in great detail; the work is minutely subdivided under different headings, and the quantity of work under each, with its calculated rate of cost, is separately exhibited. Estimates for annual and quadrennial repairs, and, according to late orders, all estimates for repairs involving an expenditure of more than (25) twenty-five rupees, must be accompanied by the report of a survey committee, attesting the necessity of the proposed work. In forwarding the estimate to the Military Board, the Superintending Engineer reports on the professional details of the design, and its suitableness to the required object, but more especially on the assumed rates, which he is bound to examine most minutely, with reference both to the nature of the work and to the cost of labour and materials in the districts where it is to be carried into execution. The estimate undergoes a further scrutiny by the Military Board, who ultimately forward it, with such remarks as they deem requisite, for the sanction of Government.

Supply of Funds.

27. Supposing the design to be approved, and the estimate passed, the Accountant-General's Department is then instructed to issue to the executive officer an assignment for the amount on the nearest treasury; and at the same time, intimation of sanction is sent through the usual channel to the executive officer, who immediately commences preparations for executing the work, either under his personal inspection, or through his subordinate agency, but always on his own responsibility.

Inspection and Progress Reports during execution.

28. If the work be one occupying some time in its execution, the Military Board receive accounts of its progress ordinarily by means of the Superintending Engineer's annual inspection journal, and by the progress reports forwarded quarterly by the Executive Engineer, who is also ordered to report specially and immediately all circumstances which may render necessary any deviation from the sanctioned design, and all fluctuations in the price of labour and materials likely to affect perceptibly the cost of execution.

Form of Survey Reports.

29. The work, when completed, is subjected to examination of a survey committee, generally consisting of regimental officers taken from the general roster for station duty; but civil buildings, especially if distant from a military station, are ordinarily surveyed and reported on by the officer to whose department they belong. The survey report contains a full specification by the Executive Engineer of the building or work, with detailed measurements of its parts, and a description of the materials employed in its construction, and an attestation by the surveying officers that the actual work corresponds with this specification, both as to its dimensions, and to quality of the materials.

Form of Bill.

30. The survey report constitutes the voucher for the bill, of which the prescribed form is shown in Appendix B. The heading contains the denomination and locality of the work, with the nature and date of the sanction obtained for its execution. The actual bill consists of a statement in three lines of the cost of labour, materials, and sundries, as per the office books, followed by an abstract of rates that would cover the above amount of expenditure, showing the total quantities of every description of work done (divided into items of detail, exactly corresponding with those of the estimate), the rates at which they have been severally executed, and the cost of each. The aggregate of the items generally corresponds with the amount charged above. The Executive Engineer is then required to add a declaration on honour, that the sums charged in the bill have been expended by him for the purposes set forth. Then follows a detailed comparison of the bill and estimates, showing the total saving or excess, and the portion of each due respectively to work estimated and not executed, or to that executed though not estimated, and to saving or excess of rates, each item of which is severally and separately compared and balanced. Finally, to this comparative statement is appended an explanation of all differences between the estimates and bill, more especially when the estimated rate has been exceeded; and in such cases the difference in particular items may be retrenched from the executive officer (if the explanation

explanation be deemed insufficient), even though the cost of the whole work be within that sanctioned for the estimate.

Objections to existing Practice in the Department of Public Works.

Complicated nature of check.

31. The system of check and audit above described, though involving great labour and no slight risk to the executive officer, would at first sight appear calculated to afford some protection to the interests of Government, but practically this object is not effected.

The degree of efficiency in construction and of economy in expenditure which is now attained in the Department of Public Works, is due more to the character of the officer employed than to the stringency of the checks imposed upon him; while the latter, by exacting more than in most cases he can possibly perform, distract his mind, tempts him to show fictitious results, and by so much interferes with his energetic and upright discharge of the duties entrusted to him.

Inquiry into the value of the several checks.

32. It will be useful to consider what is the real value of the several checks on which the Military Board are dependent under the present system.

Value of checks by Progress and Inspection Reports.

33. The only information regarding a work under construction which comes before the Board, is derived from the progress and inspection reports. The former, however, in their present shape, convey no information regarding the cost of a work, and, owing to the multifarious duties and distractions of the Executive Engineer who prepares them, and the delays which they are subject to in their transit through the Superintending Engineer's office, they seldom reach the Military Board in time to be of any use, except as records for future reference. The inspection reports are, as far as they go, a most valuable check; but the extent of a Superintending Engineer's circle does not admit of his visiting a work more than once in the course of a year, unless called upon specially to do so. In practice, therefore, the Military Board know very little about the execution of a work until it has been completed.

Value of check by Bills and Completion Reports.

34. The results exhibited in a bill for finished work, and a completion report attested by civil or military officers, unconnected with the department, containing a minute detail of rates, and a microscopic comparison of the several parts of the work as estimated and executed, is at best a retrospective check, and in most cases more or less fallacious. The completion reports are attested by officers who have no professional knowledge of the subject, who seldom make more than a cursory inspection of the building, who sometimes do not look at it at all, and who never verify the measurement exhibited in the survey report. Such a document may be received as evidence of the existence of a building, and, in some degree, of its fair external appearance, but is no proof that it contains all the work charged for.

Check by minute details of rates.

35. The minute details of rates would be unworthy of much confidence, unless the Executive Engineer should keep the accounts in such details as would admit of his exhibiting the actual cost of each item of his estimates, and this in a large work would involve more labour than he could bestow.

In practice, he generally arranges his expenditure on each work under a few general headings, which, in preparing his bills, he subdivides, so as to bring the items as nearly as may be into conformity with those of the estimate.

The difficulty of accounting for difference of rates, and the fear of retrenchment, have in some cases led to the saving on one work, or portion of a work, being applied to cover the excess of expenditure on another.

Heterogeneous duties of the Military Board.

36. The efficiency of the Military Board is impaired by the various and heterogeneous nature of the departments under its charge, the great extent of territory over which they are spread, and the eccentric position of the Board with reference not only to these territories, but to the governing authorities under whom it acts. The Military Board communicate, regarding Public Works, with the Governor-General or President in Council, and with the Civil Governments of Bengal and Agra. It does not at present communicate with the Board of Administration for the Punjaub; but a proposal has been made to give it, to a certain extent, the audit of expenditure on the Civil Works of that territory.

Inconvenience from the geogra-

37. The position of the Military Board at Fort William, the seat of the Bengal Government, and near the head quarters of the Superintending Engineers of the Lower

Lower and South-Eastern Provinces, is appropriate, as regards that portion of the Presidency. phical position of the Board.

It admits of free and rapid discussion between Government and the Military Board, as their professional adviser, and between the Board and the Superintending Engineers, as their deputies for inspecting the Public Works, and controlling the executive department; but with respect to the North-Western Provinces and the Punjaub, the case is widely different. Some idea of the extent of what may be called the "geographical" inconvenience of the present arrangement may be formed from the following sketch of the courses prescribed for all correspondence (viz., estimates, bills, and such references as the intermediate authorities do not dispose of) which pass between Executive Engineers and Government.

38. In the Bengal Presidency, references regarding Civil Works pass from the executive office to the Superintending Engineer, a distance of about - 300 miles. Exemplification of this inconvenience.

From the Superintending Engineer and the Military Board - -	100	,,
From Military Board to the Local Government - - - -	—	,,
And return by the same route - - - - - - - -	400	,,
TOTAL - - -	800	,,

For the Military Department in Bengal, references would travel the same course above detailed, were the Governor-General in Calcutta, but would frequently have to proceed 2,000 miles further, viz., 2,800 miles.

In the North-Western Provinces, references regarding Civil Works pass from the Executive Engineer to the Superintending Engineer about - - 300 miles.

From the Superintending Engineer to the Military Board - -	800	,,
From the Board to the Lieutenant-Governor at Agra - - -	900	,,
And return by the same route - - - - - - - -	2,000	,,
TOTAL - - -	4,000	,,

Regarding Military Works, if sent to the Governor-General in the Upper Provinces, a reference would travel somewhat further than the last-named distance, say - - - - - - - - - - - - 4,250 miles.
If to the President in Council, it would go - - - - 2,200 miles.

39. But the actual distance travelled is not the only, nor even the principal cause of delay. In each of the offices through which the reference passes, it is considered, reported upon, and copied for record. The amount of delay in each office will depend on the nature of the reference, the number of opinions to be collected, and the adequacy of the office establishment. References to the ultimate authority naturally multiply with the multiplication of checks, and with successive limitations of the discretionary powers of the Superintending Engineer and the Military Board. Hence the necessity for a great number of copying clerks, and the constantly recurring demandfor augmentation to office establishment. Official delays.

40. The objections by the several branches of the Government against the present system of control in the Department of Public Works, will be found in the letters named in the margin,* and which are quoted at length in Appendix (C). Objections by the several branches of Government.

41. The Government of India, as represented by the President in Council, state that considerable inconvenience is now experienced by them from the present system of administration in the Department of Public Works, and specify as instances the delay which occurs in the preparation and submission of estimates required by Government, and the still greater delay which has attended the submission of bills for works at the new stations, which have been formed in the North-Western and Trans-Sutlej Provinces. It is believed that "the whole of the bills for works at Umballa and Kussowlee, sanctioned in 1843, have not yet been sent in." By the Government of India.

42. The Government of Bengal states, that the cases in which inconvenience and mismanagement have been experienced in the Department of Public Works, are By the Government of Bengal.

* Officiating Secretary, Major Wyllie, No. 34, of 5th February 1851. The Secretary to the Government of Bengal, No. 371, of 3d March 1851. Mr. Secretary Thornton's letter, No. 63 A, of 6th February 1851, with annexures.

are so numerous, that the interval of time, from the 23d January to the 3d of March, has not sufficed to gather them in full detail from the records of Government. A collection of such cases will be forwarded hereafter; but in the meantime instances are alluded to in which the public money has been largely wasted, in which the public convenience has been compromised, and life and property over an immense tract of territory have been endangered by the neglected state of the embankments and roads. They remark, that civil buildings, and gaols for 32,000 prisoners, are not built according to a fixed and sound principle.

Alterations are frequently required by one local officer, and, when made, are repudiated by another, that the present system is, in fact, very wasteful and very inefficient.

The Government further observe, that they have no authority over the departpartment to which is entrusted the execution of their civil work, nor any direct means of knowing how the business is conducted.

They suggest that the control of all Public Works be taken from the Military Board, and entrusted to a selected individual, with an effective staff, who will be in immediate communication with the Local Government, and subordinate to them. They allude to the difficulty of carrying out this suggestion, from the Civil and Military Works being under separate branches of Government, and suggest that it would be met by vesting in the Local Government the control of both, in accordance with such directions as might be received from time to time from the Government of India in the Military Department.

By the Government of North-Western Provinces.

43. The Government of the North Western-Provinces refers the Commission to two despatches of a previous date (7th June and 10th September 1847), addressed to the Supreme Government, pointing out the necessity for a thorough change in the conduct of Civil Works, and adds, that experience of the last three years has strengthened the Lieutenant-Governor's conviction of the necessity of some such measures as he then recommended. The Lieutenant-Governor feels greatly the want of a professional adviser, as regards both the Civil Works controlled by the Military Board, and those which are executed under local funds and by convict labour.

Objections by the Government of Agra.

44. With regard to the former class of works, the Military Board are too distant and too little acquainted with local details, to be consulted "with advantage:" they are also overwhelmed with business; and so much delay unavoidably attends all reference to them, that the Lieutenant-Governor is "obliged to dispense with their authority, and by direct orders to a subordinate officer to overrule points on which, in regular course, the Board should have been previously consulted."

With regard to the extensive works of irrigation in Rohilcund, Ajmere, and Nemane, to the expenditure under the Road and Ferry Funds, amounting to (5) five lakhs of rupees a year, and to the application of the labour of 10,000 convicts, the Lieutenant-Governor is thrown on his own resources, and such casual aid as he can obtain from the overworked officers of the engineering department, who are not, properly speaking, under his orders, except with the intervention of the Military Board. The Lieutenant-Governor remarks, "that to bestow these funds wastefully or injudiciously, is to betray the public interest, and to refrain from expending them is to defraud the present contributors of the benefit which they are entitled to receive in return for their payment."

The Lieutenant-Governor considers that the present complicated system of accounts, and cumbrous detail of checks in the department of Public Works, unprofitably occupy the time both of the controlling and executive officers, hamper the latter in the discharge of far more important duties, and leave him no leisure to assist the civil officers of the district with his advice regarding local improvements.

His Honour is further of opinion, that the system of audit by comparison of bills with estimates is as injudicious, and tends to produce large estimates and careless work.

Proposed remedies.

45. The Lieutenant-Governor purposes to remedy these faults and deficiencies by entrusting the control of the Civil Works in the North-Western Provinces to a selected and well-qualified Engineer, and to place him, as member of the Board of Revenue, in close communication with the civil authorities, whose opinion on the merits of all projects for the improvement of the country it might be desirable to obtain.

He

He would introduce a system of rapid audit and adjustment of account, and would leave the Engineer leisure for his executive duties, by transferring the preparation of accounts from him to a responsible accountant, or to a separate office of account.

Objections arising from the constitution of the Military Board.

46. The constitution of the Military Board is in some measure regulated by the heterogeneous nature of the duties entrusted to that body, and is liable to serious objections. The qualifications required in a member for one branch of the business is no guarantee of fitness for the others, and the selection of members will naturally be such as to provide one at least supposed to be acquainted with each of the departments. Thus it will generally happen, that every important question that comes before the Board will be discussed by one qualified and two unqualified members.

Should the members be of a conciliatory disposition, and feel confidence in each other, they will mutually leave each department to be managed by the member most competent for it. Business in such a case will go on smoothly; but the supposed advantage of a Board will be virtually lost, each department being managed by one on the responsibility of three.

On the other hand, when unanimity is wanting in the Board's counsels, it may happen that the opinion of the one qualified man is overruled by that of two possessing little or no knowledge of the subject under discussion, or more frequently that the opposition of one man (proceeding from honest, though mistaken conviction) may so embarrass the proceedings of the Board, as to bring the public business nearly to a stand, and to throw on Government the task of settling questions which the Board are intended to decide, but which they have only complicated by their internal dissensions. A considerable simplification of procedure might be effected by allowing full weight to the decision of a majority; but this is prevented by the order, that all cases of difference of opinion in the Military Board shall be referred to Government.

As regards Superintending Engineers.

47. The circles of Superintending Engineers are generally too large to admit of complete annual inspection, unless they travel by dawk, which is unsuitable to the inspection of roads and canals, entails a separation from the office, and a consequent delay in the transmission of papers, and is, besides, not always possible.

It is also objectionable that he should quarter himself on the officer whose proceedings he has to control, and frequently there may be no other available shelter.

It appears to the Commission that increased facilities for inspection might be obtained by a judicious combination of the modes of travelling, by marching during the cold season to some parts of the districts, and reserving others to be visited by dawk in the hot weather. The itineration of a Superintending Engineer would be much less hampered, were he relieved from the necessity of keeping record copies of the papers which pass through his hands.

Late reduction of allowances.

48. The General Order, No. 113, of 22d February 1850, fixing a new scale of salaries for the different grades in the department of Public Works, and authorising a fixed office establishment for Executive Engineers, has undoubtedly been of great benefit to the service, but two of its provisions are much complained of by those whom they affect. First, the reduction of a Superintending Engineer's salary from (1,000) one thousand rupees to (800) eight hundred rupees per mensem, is not compensated by the travelling allowance of (8) eight annas per mile, which has been assigned to him. Under the new Order, he receives a lower scale of allowance than the corresponding grades in the Army or Ordnance Commissariat, though his duties are neither less important nor less arduous, and certainly do not require lower qualifications for their efficient discharge. The Commission would beg to draw attention to paragraphs 83 and 86 of Colonel Tremenheere's letter [Appendix D.]

Executive officer's travelling allowance.

49. Secondly, The travelling allowance, at the rate of four annas per mile, allowed to an Executive Engineer, is quite insufficient to pay his expenses, whatever mode of travelling he might adopt.

The Commission would respectfully suggest, that it is unworthy of a Government to assign an allowance for a specified object for which that allowance is obviously inadequate, and that it would be for the interests of the State to hold out an inducement to the executive officer to visit his outposts as often as necessity may require, rather than to deter him from so doing by making his journeys

a source of expense as well as of trouble. They would therefore recommend that the executive officer's travelling allowance be increased to eight annas per mile.

Objections as regards executive officers.

50. The present system of administration of Public Works appears to the Commission in no respect more faulty than as regards the depressed position in which it places Executive Engineers, a class of men on whose professional and moral character everything depends. Their duties, necessarily arduous in a country where they have to depend so much on their own resources, are rendered doubly so by the restrictions multiplied around them; their efficiency as engineers is of the utmost importance to the successful and economical execution of works of public utility, yet it is impaired by the imposition of duties and responsibilities, harassing and distracting in their nature, and for which the professional education of the officers has not prepared them.

Their integrity is the most effective, and, in fact, the only real safeguard against the fraudulent misappropriation of the public funds; yet they have been tempted, and in some cases almost obliged, to falsify their accounts, either to cover the expense of necessary establishments, which they were prohibited from charging openly, or to avoid the risk of heavy pecuniary loss from the want of a minute and useless correspondence between the actual expenditure and the amount of an estimate, framed, perhaps, in ignorance of many circumstances materially affecting the expenditure.

The statements advanced by Lieutenant-colonel Forbes, as recorded in Appendix E., exhibit in a very striking point of view the difficulties, whether unavoidable or officially imposed, with which the Executive Engineer has to contend.

These statements, proceeding from an officer of high character, scientific reputation, and long experience, are very important, and entitled to the fullest confidence.

Defective principle of Audit.

51. The principle on which audit is obtained for expenditure on estimated works is much complained of, and is doubtless objectionable. If there be any excess in one item of a bill over the corresponding item of the estimate, though the whole amount be within the estimate, such excess is liable to be recovered from the private resources of the Executive Engineer, unless the circumstances which led to it were reported at the time of the occurrence, and explained to the satisfaction of the Board.

These conditions, though to appearance not unreasonable, are not always easy of fulfilment. If his accounts, owing to other engagements, sickness, or paucity of office establishment, are not brought up regularly to the day, an excess may have occurred some time before discovery. The inexperience and dishonesty of a subordinate (appointed not by himself) may be another cause of excess, particularly when the work is at a distant station. A statement of such circumstances might not be received by the Military Board as a sufficient explanation, for their view of such cases would vary with the disposition of the component members, and though the enforcement of the penalty might be of unfrequent occurrence, the fear of it would continually act, and would tempt many men to evasions, by trimming their accounts, and to precautions, by sending in large estimates; they would naturally make the amount of their estimates not so much a calculation of the probable cost as the maximum for which they could hope to obtain sanction.

Minute detail in Estimates and Bills.

52. Under existing regulations all estimates for original works or repairs are drawn out in great detail, every description of work, even to the smallest item, being particularized, together with its estimated rate. On preparing the bill, a precisely similar detail is preserved, and a comparison of actual and estimated rates on each item is represented. The principle of requiring full detail in an estimate is unobjectionable.

The executive officer cannot properly prepare his estimate without making at his desk all the calculations which he is now required to show in his estimate. The additional trouble entailed upon him is therefore merely that of copying; and it may further be observed, that the present system forces upon an indolent or careless officer a full previous consideration of all details connected with a projected work; for a similar detail in bills, however, the same arguments cannot be adduced, while, on the other hand, it would entail enormous trouble to keep a separate ledger account for each item, and without such separation the results exhibited cannot be *bonâ fide*, and a habit of trimming and adjusting accounts is not unlikely to be contracted. The Commission would therefore recommend that the

the present detail in estimates should be retained, but that the bill should exhibit the total expenditure in each work, omitting the subdivisions.

Want of a code of regulations.

53. The want of a succinct code of regulations for the Department of Public Works is an inconvenience felt alike by the Military Board, the Superintending Engineer, and the Executive Officer. The rules laid down for the guidance of superintending and executive officers are to be found in an old book called the "Barrack Master's Assistant," now out of print, and in a great measure obsolete; and in a series of written and lithographed circulars, amounting to several hundreds, without index or classification, and many of the more recent cancel, explain or modify others of previous date; the older circulars were issued in manuscript; others are out of print, and have not been supplied to any of the newly-formed divisions.

Under such circumstances, it is impossible for an officer to be as well acquainted as he ought to be with the rules under which he is expected to act; nor can the Military Board properly enforce regulations promulgated in so imperfect a form.

Compilation of circular Orders undertaken by Lieut.-colonel J. T. Boileau.

54. It is understood that a revised compilation of these circular orders is in course of preparation by Lieutenant-colonel J. T. Boileau, Engineers; but the Commission would urge upon Government the adoption of the promptest measures to supply a want so obviously prejudicial to the department, and unjust to the officers employed in it.

Lieut.-colonel Goodwyn's suggestion for a new manual for executive officers.

55. The Commission would beg to draw attention to a valuable suggestion made by Lieut.-colonel Goodwyn, in his letter, No. 1,839, of 4 January 1851 [*see* Appendix D.], for the preparation of a new manual for executive officers; such a compilation, if judiciously executed, would be of great value to the department.

Qualifications of executive officers in the Department of Public Works.

56. There is reason to believe that in some instances the interests of Government have suffered from the executive charge of works being entrusted to ignorant and inexperienced officers, and it appears to the Commission that this source of mischief is not at present effectually guarded against.

Recommends probation of young Engineers;

57. The officers of engineers receive an education at home, which furnishes them with scientific knowledge sufficient for any duties likely to be entrusted to them; but on their first arrival they are ignorant of the language and resources of the country, and want practical experience in the numerous details involved in the execution of works.

Every young engineer, therefore, should, in the first instance, be appointed an assistant to an executive officer, and should not receive an independent charge until he have acquired that proficiency in Hindustani contemplated in General Orders, 9 January 1837, and until he have obtained from a Superintending Engineer a certificate of qualification for an executive appointment. But there are many officers in the department not belonging to the corps of Engineers. A return furnished by the Military Board shows that, out of 95 appointments in the Department of Public Works, 47 are held by engineers, and 48 by officers of other branches of the service. The Commission would be understood as not wishing to cast any reflections on the last-named class of officers, of whose qualifications they have had little opportunity of judging, and who number among their ranks one, at least, of the most scientific engineers in the country (Colonel P. T. Cautley): they would merely record their opinion, that, as a general rule, such appointments would be better filled by officers regularly educated for the duties which they involve.

And examination of line officers.

58. The corps of Engineers however, as at present constituted, cannot supply the number of officers required, nor is it desirable that the Department of Public Works should be closed against qualified officers from any branch of the service, provided always that their qualifications be previously ascertained and certified by an examining committee.

Defective nature of subordinate agency.

59. The Commission beg to direct the most earnest attention to the unanimous nature of the evidence given by those witnesses who have spoken on the subject, as to the extremely defective qualifications of the subordinate agency, through whose instrumentality the Executive Engineers are expected to construct the Public Works, and to carry on their important duties. The Executive Engineer has no power to punish a careless or dishonest overseer, and cannot procure his

removal without much trouble. The native agents are frequently intelligent men, and those who have been long in the department, possess considerable knowledge of the routine duties. They are good accountants, but devoid of geometrical knowledge, and can seldom understand plans. They are believed to be as honest as the natives in other branches of the public service, and, under a system of close check, or where there is no opportunity for fraud, they may be employed with advantage in the execution of ordinary work. The only remedial efforts that are now in progress for the correction of this vital defect are those being made by the Lieutenant-Governor of the North-Western Provinces, through the medium of the Roorkee College. The Commission would earnestly recommend an extension of this valuable institution as regards the training both of Europeans and natives.

Suggestions for improving the corps of Sappers and Pioneers.

60. They feel also bound to refer to another department, the corps of "Sappers and Pioneers," which, with due attention, and some organic improvements, ought to afford efficient aid to the Public Works Department, by furnishing an useful agency for the supervision of work. A member of the Commission, Major Kennedy, states, that even under their existing organization, after a short training, and guided by distinct rules [*see* Appendix G.], he was enabled to conduct with economy and efficiency an extensive work in the Hill States, by using the N. C. officers and privates of a Pioneer company as his overseers and assistant overseers of the works. They are unanimous in their opinion, that the proper application of this important corps' energies would be found in employing them, after a sufficient training, as directors of works, and not as mere labourers.

The present strength of the Sappers and Pioneers corps may be about 1,000 men, and in the vast territories of Bengal, the North-Western Provinces, and the Punjab, the actual work of 1,000 day-labourers, more or less, can be but of slight importance; whilst the accession of 1,000 well-disciplined and well-qualified directors of labourers would form a very important element to secure a due return for money paid to more than 100,000 men, or 100 times more than their own numerical strength of ordinary labourers of the country.

The change thus recommended in their constitution would operate as beneficially for Military as for Civil Works, whether in reference to the construction and repair of barracks and cantonments, the raising of batteries or entrenchments for an army in position, the operations of a siege, or the opening communications through a mountainous or jungly country, for an advancing or retreating force. Under any of these views, their individual exertions as labourers could effect but little, whilst, as well-trained directors of the labours of others, they would offer an enormous resource. For these reasons, it is recommended that the Sapper and Pioneer corps be condensed into one corps of Sappers. That in their enlistment a very choice selection of men only should be received, principally artisans who can write That they should have an increased number of well-selected European non-commissioned officers always kept efficient, by filling up the places of any who should be drafted from a company for other duties, and that no commissioned officer or sepoy who had proved himself worthless in any other duty, should be thrown back upon his corps.

Finally, that the several companies should be commanded by officers of the corps of Engineers, and should undergo regular and periodical training at the head quarters of their corps, to qualify them, and to maintain their efficiency for the performance of the important duties above contemplated. The Commission would further recommend, that all overseers and assistant overseers of any class should henceforth be furnished with precise rules adapted to the particular works under their charge in reference to the mode of mustering and conducting the working parties, a crowded or disorganized mass of labourers being the mere pickpockets of their employers.

Contingent and surplus Funds.

61. The existence of contingent fund accounts in the offices of some of the Executive Engineers, and of surplus cash in the treasure chests of others, have been, in the course of inquiry, brought to the notice of the Commission; and though it is understood that these funds, and some of the abuses which have grown out of them, have already been under the consideration of Government in various ways, both directly and indirectly, and that rules have been passed and arrangements sanctioned which will prevent the recurrence of the practices objected to, still it appeared to the Commission that their inquiry would be incomplete without a thorough investigation of a subject which seemed peculiarly calculated to show the

the real working of the system. They have therefore omitted no opportunity, since the subject was brought to their notice, of obtaining, from executive officers and others examined by them, the most particular information on the origin and application of these funds. They have also called on Superintending Engineers for reports and opinions on the same question, and have obtained from the Military Board copies of all the correspondence which has reference to the same subject. The information thus collected is fuller on some points than any that has been submitted to Government; it may, therefore, be useful to place the whole subject in a clear point of view, tracing to their origin the abuses which have arisen, and apportioning fairly the blame which attaches to the various parties concerned.* The General Order, dated June 3d, 1819, clearly fixes the salaries of district barrack masters (expected also to perform the duties of civil architect) at 600 rupees per mensem, which was intended to cover all expenses for stationery and office. The duties at that time were simple, and the works comparatively few, involving a trifling expense for office.

Circumstances in which they originated.

62. The extra office establishment required for new works was not within the scope of the Order; for we find, on the 13th July 1822 [*see* Appendix H.] it was ruled by a General Order that all such expenses were to be included in the bills and estimates, and not charged, as theretofore, in contingent bills. It is not quite clear whether extra *office* was adverted to; but this was the construction placed on the Order by the department generally, and the custom appears to have obtained almost universally (where there was no recognised establishment) to form a contingent fund derived from sums charged to the works over and above those disbursed for labour and materials, and applied to the payment of a portion of the office. This arrangement appears to have been made with the cognizance of the Superintending Engineer and the Military Board; for the books of the fund appear to have been kept publicly in the Executive Engineer's Office, and to have been open to the inspection of the Superintending Engineer: it received the demi-official sanction of one respected member of the Military Board, the late Colonel A. Irvine, C. B. (as mentioned in Answer 434, Appendix F.), and is not only sanctioned, but recommended in a letter written by the Military Board for the guidance of a young officer inquiring how the office charges were to be brought forward: a perusal of paragraphs 4, 5 and 6 of the Military Board's letter, No. 8,535, of April 1844 [*see* Appendix I.], will show that the Board were not laying down a new rule, but describing a recognised practice. But even if it were intended that the extra office expenses entailed by new works should be borne by the officers, still there are other contingent expenses incidental to executive operations, and these are universally included in the estimate, and sanctioned in the form of a per-centage, either of 5 or 10 per cent., for contingencies. The mode of apportioning incidental charges by means of a contingent fund, as prescribed by the Military Board in April 1844, and as again explained and justified in the 22d paragraph of their letter, No. 8,836, of 5th March 1850, addressed to the President in Council [*see* Appendix K.], is unexceptionable in principle, and the sums so apportioned, being necessary items of expenditure, might be charged in the Executive Engineer's bills, and attested on honour without the slightest culpability.

Abuses of contingent Fund.

63. The practice, however, is dangerous, as experience has proved, and, without the utmost vigilance, is liable to degenerate into very serious abuses, as regards both the source and application of the contingent fund. Instead of being maintained by an uniform per-centage on all expenditure, it has been generally taken in a larger proportion from works executed within the estimate than for those which had reached the sanctioned amount; in short, to adopt an expression used by many of the executive officers, it was usually taken "from the works as they could bear it." Again, the application has been equally misdirected. In some instances, the whole office expenses have been paid out of the contingent fund, and occasionally it has been converted into a profit and loss account, to cover casual losses, and to meet the excess of expenditure over estimate on any particular work.

64. In

* It may prevent misconstruction to state in this place, that a member of the Commission, Major Baker, performed executive duties solely in the Canal department, where a sufficient office establishment was allowed him by Government, and where, therefore, there was no contingent fund.

How far attributable to the Military Board and Superintending Engineer.

64. In pointedly calling attention to these facts, the Commission would record their reprobation of practices which have actually run to such objectionable lengths and might have covered a great extent of fraud and embezzlement. They wish however, in justice to the character of the service, to record also their opinion that the blame must be shared by the Superintending Engineer, the Military Board, and the Government. Superintending Engineers could not have been ignorant of practices which had so generally obtained in the department; for it was their special duty to inspect the books of each executive office, in which, according to the unvarying testimony of engineers, the records of the fund were publicly kept; and if they considered the existence of the fund objectionable, it was more particularly their duty to see that it was properly conducted. The Military Board, as already observed, distinctly recognised the practice.

How far attributable to the acts of Government.

65. But the regulations of the Government have also contributed to these results. When a Supreme Government enacts rules for the procedure of its subordinates, which the latter find themselves unable, under ordinary circumstances, to carry out, or which bear heavily or unfairly upon them, such regulations will be either protested against or evaded: the former is the more upright course, but is attended with difficulty, and frequently with danger to the interests and prospects of a subordinate: the latter is easy, especially under vague regulations, and will be usually adopted. In the present case there are two regulations to which the above remarks apply. The first fixed a salary for executive officers, which was also intended to cover an indefinite charge for office expenses, the deduction on this account being certain to increase with the extent of the office work, and the remuneration, therefore, bearing an inverse proportion to the labour. The second ruled that the audit of his expenditure should be based on the strict conformity of his bills with his estimates, the latter being avowedly a calculation of probabilities, the former professing to be a record of facts. Unless the facts were brought into accordance with the assumed probabilities, the officer was liable to personal retrenchment, and thus incurred all the liabilities of a contractor, without the possibility of sharing his profits. The natural, though certainly not the justifiable consequences of such a principle of audit, have been exhibited in paragraph 63. The Regulation of 1819, regarding the salaries of executive officers, has been since superseded, and provision is now made for an office establishment generally adequate to the current duties of the department, with a prescribed mode of increasing it when there might be a recognised necessity for so doing. The objectionable principle of audit still remains; but the Commission confidently hope that this also will speedily be superseded, either by the adoption of the procedure recommended in this Report, or of some other which the Government may think better suited to secure so desirable an object.

Suggestions for Remedial Measures.

Necessity for changing the controlling agency of Public Works.

66. Having now discussed in detail the difficulties experienced under the present system by every branch of the service in any way connected with the Department of Public Works, it remains to consider how far the evils complained of may admit of remedy. The Commission, while duly impressed with the conviction that a radical change in the management of an extensive department, if not of obvious and urgent necessity, may be the source of greater evils than those which it is intended to obviate, have, notwithstanding, come to the conclusion, that an entirely new system is essential to the efficiency of the Department of Public Works, as regards both the controlling and executive agencies. In territories of such extent as those comprising the Presidency of Bengal, it has been experimentally proved to be inexpedient that the business connected with the Public Works should be referred to one authority, which has thereby been burthened with more work than it can efficiently perform, and is too far from the scene of operations to carry on its duties with promptitude and energy. The Commission, therefore, recommend that each of the great territorial divisions of the Presidency, viz., the Bengal, the North-Western, and the Trans-Sutlej Provinces, should have its separate and independent agency for the control of the Public Works, subordinate to and in direct communication with the Local Governments.

Advantage of individual responsibility.

67. The agency proposed would be a single selected responsible individual, exercising in each Province the functions now performed over all by the Military Board. The Engineer member of the Board is at present the only competent authority

authority on all engineering questions connected with the Department of Public Works. It would be better, therefore, to dissociate him from the unprofessional members, from whose concurrence his opinion receives no additional weight, while, by their dissent, it is liable to be set aside. In the one case the engineer does not fully bear the responsibility for acts and opinions originating with himself, and, on the other, he is saddled with that which by no means belongs to him. Responsibility is better fixed upon an officer, and is more felt by him when he gives an opinion as his own, than when it goes forth as the collective opinion of a Board. The constitution of a Board acts as a screen, behind which the members shelter themselves from all individual responsibility. The continuity of purpose so essential to the energetic direction of Public Works would be better secured under the direction of an individual than it can be at present, and much of the delay would be obviated which is now incurred in collecting the opinions of several members, and amalgamating them when discordant. The principal argument against the proposal is the possible unfitness of the individual entrusted with so responsible an office. This objection is entitled to peculiar consideration in a service where seniority is the usual rule of promotion, and certainly the Commission would not recommend that such important interest should be placed at the mercy of a man whose only and chief claim to the trust is his being the senior engineer officer in the country. On the contrary, they would distinctly and emphatically record their opinion, that the professional advisers of Government should be the men best qualified for the duties, without much reference to the branch of the service to which they may belong, or to their place in a seniority list.

In cases requiring mature deliberation, it may indeed be questioned whether a Board might not be a safer authority than an individual; but, in the first place, such deliberations, to be useful, must be the deliberations of men properly qualified professionally for the discussion; and, in the second, it must be borne in mind, that the Public Works form a strictly executive department, in which promptitude, skill, and well-directed energy are essentially requisite. It is true, indeed, that the fullest consideration is necessary and imperative previous to the adoption of a design or sanction of an estimate for new works; but in this respect the Military Board, as at present constituted, have no power. Such projects must pass through the Local and Supreme Governments, and if involving more than a small expenditure, are referred to the Court of Directors, thus insuring the fullest consideration and discussion of details.

Authorities in favour of undivided responsibility.

68. The relative efficiency of a selected individual or a collective body for executive duties is a question which has called forth much discussion, and has given rise to some difference of opinion. The Commission, therefore, are anxious to support their own decided preference of undivided responsibility, by quoting the recorded sentiments of men whose opinion is entitled to the utmost deference.

Honourable F. Millett.

69. In a minute, dated 19th November 1846, by the Honourable F. Millett, on the subject of the superintendence and management of Public Works, the following passages occur:

Para. 18. "I am not favourable to the establishment of a separate Board or Boards. The multifarious duties of the Military Board, embracing the Army and Ordnance, Commissariat, military buildings, and the stud, render it necessary that that Board should consist of several members of varied experience; but for the superintendence of the civil branch of Public Works by itself, I should prefer a single officer for each division of the Presidency, to be selected for his scientific attainments, experience, and personal activity, and to be held responsible for the proper management of the department."

Para. 19. "A project to establish a Board in each division of the Presidency, composed of members entertained and paid exclusively for this duty, would be inadmissible on the ground of expense alone; and I do not think it would be found convenient to associate with the fixed President in the North-Western Provinces, even for a few months in the year, more than one Superintending Engineer. Two is a very inconvenient number in the composition of a Board, and the partial assistance which, under any circumstances, the Superintending Engineer could give, would involve the objection of a divided responsibility, without preponderating advantage, and at the same time interrupt their own immediate duties.

Military Board.

70. The Military Board also, in the 11th, 12th, and 13th paragraphs of their despatch,

despatch, No. 10,077, of the 27th April 1847 (adverted to by the Honourable Court of Directors in their despatch of the 30th January 1850), propose that the Civil Works in both divisions of the Presidency should be placed under the control of an Inspector, "who would be vested with the duties and functions now discharged by the Military Board;" and the present Chief Engineer, Sir J. Cheape, K. C. B., still advocates the same plan, the adoption of which, he considers is calculated to place the department on a footing of increased efficiency. Lieutenant-colonel W. H. Forbes, an engineer officer of the highest reputation, has expressed a decided opinion [*see* Appendix E.] in favour of undivided responsibility in the control of Public Works, military as well as civil. The Deputy-Governor of Bengal and the Lieutenant-Governor of Agra have expressed similar opinions to the extent that the Civil Works at least should be removed from the control of a Military Board, and placed under a separate authority.

The Government of Madras.

71. The Government of Madras, in their despatches to the Court of Directors, dated respectively 26th September, 26th October, and 16th December 1844, appear to have advocated a system of "separate and individual responsibility on the part of an officer in the Department of Public Works." And the Honourable Court, in their reply to these despatches (No. 12 of 1845, of 29th May 1845), though not then convinced of the necessity of the proposed change, express themselves willing to entertain the subject, should the Madras Government continue to think such a measure desirable.

Lord Hardinge.

72. The Right honourable Viscount Hardinge, late Governor-general of India, in his despatch to the Honourable Court of Directors, No. 11, of 1845, dated June 1845, proposes to relieve the Military Board from all duties connected with Civil Works, and to appoint an efficient Superintendent to correspond direct with Government on all subjects relating to his charge with inspecting or superintending engineers under him.

Arguments applicable to Military as well as Civil Works.

73. But the arguments which have been adduced for the placing of Civil Works under a separate and single controlling officer, would apply equally to the whole department. For the Military Works in this country, excepting fortifications, of which there are few, and which might be left to the charge of the Chief Engineer, are not essentially different from the Civil. Both require the same qualifications in an Executive Engineer, and might be carried on concurrently with the same machinery of superintendence. If, therefore, it be admitted that the control of the Department of Public Works should be vested in a single responsible individual, the next point for consideration is the necessity for separating the Civil from the Military Works under separate agencies. The Commission are aware that such a separation has been advocated by many able and eminent men, and that the present distribution of administrative power between the Supreme and Local Governments, appears at first sight to render some degree of separation necessary, since, in the present form of the Indian Government, the ultimate authority regarding Civil and Military Works is already divided; the control of the former being vested in the Civil Governors of the Bengal and Agra Provinces, and that of the latter in the Supreme Government.

Proposed organization.

74. The Commission cannot, however, in justice to their own convictions, consent to propose any arrangement based upon a principle which they conceive to be erroneous. They would propose that the Bengal Presidency be divided into subordinate Local Governments, which should be invested with authority to control both Civil and Military Works. Each Province might then be subdivided into compact and manageable districts under executive officers, superintended by an Inspector (aided by two or more deputies), in direct communication with the Local Government. The discretion of the Local Government with regard to the sanction of new projects, and the decision of the more important questions relating to the Department of Public Works, might be limited as at present.

As regards the executive officers, there is, as before observed, no incompatibility in Civil and Military Works, nor any sufficient reason why they should not proceed concurrently under the same executive management.

It is obvious that two officers severally conducting all the executive duties of two districts, would be much nearer their work, and, therefore, better able to attend to it, than if one were to conduct the civil, and the other the military duties of both districts. In short, that if the Civil and Military Works are to be placed under separate management, either the number of executive officers must be greatly augmented,

augmented, or else the size of their divisions, already in many cases too large, will be increased to an inconvenient extent. The same, or analogous reasons, hold good with regard to the inspecting officers; nor does it appear objectionable that the Local Government should (under the control of the General Government in this, as in all other public affairs) direct and audit the expenditure in the maintenance of cantonments, and provision of accommodation for troops; the movement and location of these troops remaining, as at present, at the immediate discretion of the Supreme Government.

Duties of Inspectors.

75. The Inspectors would remain generally at the head quarters of the Local Government to which they are attached. In forwarding estimates and bills and important references, they would append such remarks as they deemed requisite. Calculations would be checked, and accounts analysed in their office, and they would exercise the same control over the Department of Public Works as is now vested in the Military Board.

As a general rule, the itineration of the Inspector would be restricted to that of the Local Governor, whom he would accompany in his annual tour; but on special occasions he would be available for inspecting a completed work, or the site proposed for a projected one. In ordinary cases the duty of itineration would be performed by the Deputy Inspectors.

It would be competent to the Lieutenant-Governor to place the Inspector in communication with the Board of Revenue for the discussion of projects, or other matters likely to affect that branch of administration. But the Commission cannot adopt a suggestion which has been made to give the Inspector a seat at the Board of Revenue. Such an arrangement would be productive of delay as regards the Public Works Department, would place the majority of votes in the hands of the unprofessional members, and would injuriously divide the responsibility of the executive management. Every advantage expected from the full discussion of projects for the improvement of the country by the Revenue Board, may be better secured by a separation than by an amalgamation of the powers of the revenue and the engineering authorities. The Inspector would be the best judge of the fitness of a project for its intended purpose, and of the correctness of the estimates for its cost, while the Board of Revenue would have to consider whether the object itself be desirable, and whether it be worth the calculated expenditure.

The Inspector would audit all bills for authorised expenditure, whether on works, repairs, or establishments, under such regulations and with such limitation of discretion as may be deemed desirable. He would forward all audited bills for adjustment to the office of the accountant, whose duty it would be to see that he had not exceeded his powers. He would especially report to Government on all unauthorised expenditure, including bills in excess of sanctioned estimates. The Inspector would report periodically on the subordinate agency, both European and native, in the Department of Public Works, and would bring forward the most deserving for promotion on the occurrence of a vacancy. The Inspector would necessarily require a complete office establishment, and the aid of a commissioned officer, who would be responsible to him for the working of each branch of the office.

Deputy Inspector.

76. The Commission have not data for determining exactly the number of Deputy Inspectors that would be required. But the extension of Civil Works, including those defrayed from local funds, would add to the present duties of inspection. They would have no office of record, and would not be tied to particular localities, or rounds of superintendence. They would be entirely subordinate to the Inspectors, and disposable for itineration, or temporary location near particular or important operations. They would not be the medium of correspondence between the Executive Engineer and the Inspector, except when the latter might consider such an arrangement advisable.

Measures of relief to executive officers.

77. The duties which the Commission would propose from Executive Engineers vary, in some essential points, from those now imposed upon, or rather expected from, those officers. It may be needful to re-consider the distribution of executive districts, and, in some instance, to reduce the extent of the present divisions; but the Commission are of opinion that, where the duties are now found to be more than the executive officer can efficiently perform, it arises rather from the incongruity than the extent of the duties imposed upon him, and the remedy lies

rather in the division of the duties, than in the reduction of the extent of his charge.

Barrack Master's duties, and petty repairs.

78. In the Military Department, a considerable relief might be afforded to the Executive Engineer, by placing the charge of the barracks, barrack and hospital furniture, petty repairs in regimental lines, and the conservancy of stations, in the hands of an invalid or warrant officer, as suggested by Colonel Tremenheere, in the 63d and following paragraphs of his communication [*see* Appendix D.]. This assistance is even now nominally allowed by the General Orders of the Governor-General of 12th July 1816, quoted at page 864, paragraph 20, of the Pay and Audit Regulations [*see* the Appendix Q.]; but the Order, if ever acted on, is now obsolete. Besides the appointment of such an officer, the Commission would recommend that the petty repairs of civil buildings should, within certain limits, be executed by the officers occupying them.

Separation of engineering duties from those of book-keeping.

79. But the most important alteration in the duties of the executive officer, and the one which the Commission wish to recommend most strongly for adoption, is the entire separation of the strictly engineering and executive duties from those of book-keeping. To quote the words of one of the members of the Commission, in a letter to the Governor-General of (17th September 1850), "As the main security for the economical construction of Public Works depends upon the principal officer in charge, and all his subordinate superintendents being free to devote their entire attention to that construction, there can be little doubt that the expenditure upon Public Works in India would be vastly reduced, and rendered much more efficient, if a distinctly responsible accountant, separate from the engineer in charge, were given to each Public Works district, where extensive operations are in progress."

"The Engineer is not an accountant by profession; and, as the whole responsibility of accounting for large sums of money now devolves upon him, his anxiety to avoid ruin must force him to devote a much larger proportion of his time to his accounts' office than the interests of the constructive department would warrant; and, even after he has done so, to the injury of the works, I have observed that the anxiety of having large unaudited sums of expenditure hanging over him for a long period has created a feeling almost amounting to terror in taking the charge of Public Works; so that many would gladly sacrifice the increased emolument which accompanies such a charge, and rejoin their corps as military officers, to avoid this dangerous responsibility."

"The separation of the accounts from the constructive branch need not produce an increase of expenditure, and it would, besides allowing to the works the full time and attention of the officers charged with their construction, afford an additional security against fraud, inasmuch as the engineers' and the accountants' department would become reciprocal checks upon each other."

Remarks on periodical audits.

80. Another radical change in the system of accounts which the Commission recommend is the periodical rendering of bills, with immediate audit; and they are of opinion that the period should be monthly. The principle has been in operation for above three years on the Ganges Canal, and has worked well. Colonel Cautley, in a very valuable memorandum [*see* Appendix L.] on the subject, says, "The principle is excellent; it is advantageous to both the director of the works, to the executive officer, and to the Government; the quarterly system now practised might, in my opinion, be improved by a monthly submission of bills, with a monthly audit; but the present arrangement in the department of Public Works of combining the duties of the officer as a civil engineer with those of account, renders both the quarterly and monthly systems open to inconvenience."

"The executive officers like the system, as it gives them the means of seeing, at short periodical dates, the whole of their transactions, and of remedying any irregularities which have obtained previously; they are relieved, moreover, at short intervals from money responsibility."

"To the director of the works the system is a most advantageous one: he has before him constantly the results of operations, and, from the necessity of the executive officers closing their accounts periodically in rapid succession, he obtains the true rates at which work has been executed, and is able to compare the rates of the different divisions, and to draw his inferences accordingly. As a proof of the great value of this periodical comparison, I may state that in nearly every case a progressive decrease of rates has been arrived at.

"In

"In conclusion, therefore, it will be understood that I not only consider the quarterly system to be good, but that a submission of bills monthly, with a monthly audit, would be still more beneficial; in both cases, however, the system must be combined with a relief to the civil engineer (in some degree at least) from his present double duties of account and engineering. I consider that men who can do both duties efficiently, are exceptions, and that on the Ganges Canal, where so much and such heavy work is in progress, the civil engineer's whole time might, with the greatest advantage, be confined to his now specific duties." In these sentiments the Commission fully concur, and they have endeavoured to complete the measure by relieving the executive officer from accounts.

81. The accumulation of unaudited balances under the present system has reached an enormous extent. A return quoted in Appendix R. shows that the average amount of bills passed for Public Works in the last six years has been *Rs.* 37,23,635. 8. 5¾. The unaudited balance, as per memorandum, from the Accountant-General's Office [*see* margin], is *Rs.* 1,47,46,173. 5. 3., or nearly four years audited expenditure.

NET BALANCE against EXECUTIVE OFFICERS in the Building Department, including both Current and Old Accounts, on 30th April 1849.

In the Military Buildings - *Rs.*	87,00,847	13	1
In the Civil Buildings - - -	22,04,480	3	7
	1,09,05,328	0	8
Inefficient Balance in the hands of executive officers on the N. W. P., on 30th April 1849 (Civil) - -	38,40,845	4	7
Rs.	1,47,46,173	5	3

The results, injurious to Government, are ruinous to the engineer, who is unable, even on medical certificate, to quit the country without leaving unlimited security. A striking illustration is recorded in the examination of Major Abercrombie [*see* Appendix F.] sent, with an efficient office, to construct extensive cantonments in a new country; he was unable to keep up his accounts, and was subsequently employed for 18 months (without staff salary) in adjusting his arrears, amounting to seven and a quarter lakhs of rupees. Three months after the submission of his last bills, he arrived at Calcutta, and found that they had not yet reached the Military Board's Office.

The Commission observe, that all executive officers on their appointment are called upon for security to the amount of 5,000 or 10,000 rupees. They object to this rule as applied to commissioned officers; but if enforced, no further security should be required from them under any circumstances.

Recommends a system of contract.

82. The Commission would strongly urge the general, and, wherever possible, the enforced introduction of an organized system of contracts for all descriptions of work. Tenders might be invited for every sort of materials to be supplied on the spot, for any kind of labour, or for a complete work.

It would be advisable in the commencement to divide the contracts, that completion might be encouraged, sub-letting prevented, and residents of the place whence the raw material (whether animate or inanimate) is derived, brought forward.

There can be little doubt that the general adoption of contracts is feasible: the East India Railway is being constructed in no other way. Colonel Tremenheere states [*see* paragraph 30 of Appendix D.], that he has introduced contract labour for different kinds of work in three divisions of his circle, Loodiana, Ferozepore, and Jullundur, and contracts are now taken to excavate the earthwork of the Ganges and Jumna Canals generally, to repair the embankments of the Lower Provinces, and frequently to manufacture materials in all parts of the country.

Terms and conditions of contract

83. The specification of every contract should be full and explicit; the time for performance distinctly stated; adequate security lodged; penalties, not over heavy, but invariably enforced on any breach, attached; and the decision of the Engineers, with rare exceptions, final. The general terms and conditions of contracts, especially as regards advances, should be embodied in a few concise rules for the guidance of Executive Engineers, who will receive credit for advances made in conformity with the regulations.

The rates for every description of work are well ascertained, and will afford a ready means of testing the fairness of the terms offered. An enhanced cost is to be expected at first, and should not be regarded. It is the nature of all changes to appear in the beginning difficult and expensive; but if the change be a real reform, these will soon correct themselves. A contractor making a fortune by his bargains with the executive officer, raises up a hydra-headed competition, and is the best possible advertisement for future contracts.

The Commission would press upon all concerned, that the contract system requires from executive officers and overseers a strict and constant supervision to prevent inferior workmanship; they will be held responsible for the goodness of the work executed on contract in their divisions. Ample time would be placed at their disposal by the contemporaneous relief from petty details, which is necessarily part of the system.

Recommends immediate adoption.

84. It may be observed, that the extension of the contract system already recognized might be effected at once, without awaiting to consider the other suggestions in this Report. There is no executive system that would not admit of contracts, and would not be simplified by their adoption.

Proposed office of account for all work.

85. Until the general introduction of contracts can be effected, and when circumstances may render necessary the immediate execution of a work for which tenders cannot be obtained, the accounts of expenditure should be kept in such form as will show each charge supported by its voucher of payment, and will admit of monthly audit.

The pecuniary responsibility will rest, as at present, with the Executive Engineer, who will receive advances, and account for them. He will be allowed the assistance of a qualified accountant, and of a native cashier, who will give security in proportion to the current expenditure. The accountant will be held responsible for the accuracy of the book-keeping, and will sign the accounts. The cashier will be held responsible for all money entrusted to him, and will make no payments except under warrants signed by the executive engineer and accountant, the signature of the latter attesting the entry into the cash-book.

Proposed form of accounts.

86. Estimates will be submitted in the form and detail now in use. The basis of the accounts will be the day-books, kept separately in the form of a figured abstract for each work, without the subdivisions required in the estimates, and showing the expenditure of every description. The payment of daily labour will be attested on the day-book by the executive engineer or his deputy. Periodical payments of monthly labour will be similarly vouched; materials will be charged at the store prices; their quantities and rates will be susceptible of check by comparison with the store account. The day-books will be totalled every week, or rather quarter-monthly, and forwarded in original to the Executive Engineer, who, after examining and comparing them with the quantity of work done, will make them over to the accountant for incorporation in his bill; they will be transmitted as vouchers with the bill, without retention of copies. The cost and expenditure of stores will be exhibited in a debtor and creditor account, showing on one side the purchase of materials, supported by receipts and the cost of their manufacture, taken from the vouched day-books; and, on the other, the value of the materials issued to works, and of those remaining in store.

The monthly bill will exhibit the expenditure on each work, as shown by the weekly day-books or vouchers, the amounts advanced to contractors, and the difference (whether subtractive or additive) taken from the store account, between the amounts expended in materials and those recovered by issues from store. The monthly progress report will show the quantities of work done under each estimate, and their actual cost contrasted with a valuation at the estimated rates, the quantities of work remaining to be done, and the balance of unexpended cash.

When any work shall have been brought to a close, a completion statement will be compiled from the monthly bills, and (accompanied by a survey report in the usual form) will be submitted to Government. It will exhibit a final comparison between the estimated and executed work, and will correct any errors in measurements which may have crept into the periodical bills. The "cash-book" will be kept by the accountant, and will contain a record of all monies received, and of all warrants on the cashier issued by the Executive Engineer. Money paid by order on the collector will be entered in the cash-book as received and issued.

Advances to contractors and agents on detached works, also sums exceeding *Rs.* 50 due for materials, will be paid by an order on the public Treasury; the order may be in the present form of a receipt in duplicate, for an instalment in part of a specified assignment, and inserting the name of the payee, and object of the payment, or more conveniently by cheque and pass-book. A cash account current, submitted monthly, will be signed by the Executive Engineer, who will certify that he has counted the cash balance.

87. The

87. The combination of European and native agency is the arrangement best calculated to secure an efficient check. The European should be entrusted (under the Executive Engineer) with the general direction, the distribution and muster of the labourers, and the measurement of work. The native agent should also count the labourers, pay them in the presence of the overseer, and act generally as his assistant in supervising the work. The European and native should send in separate accounts daily, at the Sudder station, or weekly at outposts, to the Executive Engineer. The Commission would strongly recommend to Government to complete the subordinate establishment to the extent necessary for carrying out a double check in all the principal works. And they would suggest that it be made obligatory on Executive Engineers to separate the duties of direction and disbursement on the principle above described, however, and as far as they may be furnished with the means of doing so.

Mutual check by subordinate establishment.

88. The Commission have considered the plan of account [Appendix M.] suggested by Mr. Marten, accountant on the Ganges Canal, recommended by Colonel Cautley, and approved by the Lieutenant-Governor of the North-Western Provinces. It is proposed that the day-books, &c., kept by the overseers, *i. e.* the rough material for the accounts, should be sent as received by the Executive Engineer to the director's office, and there digested. The results, in the form of a table of rates, would be sent, as soon as they can be deduced, to the Executive Engineer, with such remarks or warnings as may be necessary. The bills would be prepared in the director's office, and forwarded by him for audit.

Mr. Marten's plan of accounts of the Ganges Canal.

In the first place, the Commission cannot recommend that in any case the accounts of subordinates should pass through the Executive Engineer's hands without such a preliminary examination as would enable him to judge at once of the economical execution of the month's work. The table of rates furnished from the central office would be too late to be of much use.

2dly. In the adjustment of various accounts there will be occasion for frequent reference to the disbursing officer, who should not be too distant to admit of oral explanations.

Both these objections would tell against the general adoption of the plan, but would have less weight as regards the Ganges Canal, which, in fact, is but one great work, the details of which are perfectly known to the Directors; but some previous scrutiny of the accounts by the Executive Engineer would be indispensable, as indeed suggested by Lieut.-colonel Cautley, in the 14th paragraph of his letter [Appendix D].

89. Instruments and certain English stores are supplied on indenture to executive officers from the arsenal and other magazines, and the value is afterwards communicated by the Military Board to the Accountant-General, who debits the officer with the amount.

Magazine stores; mode of issue.

Similarly, when instruments or stores are returned to a magazine, the value is not then settled by, or even known to, the parties giving and receiving; but after the lapse of some time, the officer is told by the Accountant-General that he has been credited with so much of the stores.

90. There are many disadvantages in this system, and several officers have complained.

Inconveniences experienced.

The delay is often very considerable, more particularly when stores are returned. In this case, it is necessary for a committee to be appointed to determine their state, which is not investigated before the officer returning the articles, but at some future period fixed by the Commissary of Ordnance. The committee's report is sent to the Board, who declare the value, and inform the accountant of the amount.

Again, it sometimes happens that the Board assign at different times two values to one article, occasioned by some alteration in the English price, overlooked or unknown on the first occasion; and officers, after the passing of their bills, and the closing of their accounts, have been obliged to make good, out of their pockets, the difference of the two values, both having been calculated, long after the issue, by the same authority. To understand the full hardship and injustice of such a mode of procedure, it is only necessary to remember, that, as far as the executive officer is concerned, the price of magazine stores is in no way a cash transaction, but a mere transfer from one head of account to another, of the value of stores belonging to Government. The Commission beg to refer to a remarkable instance

of this mentioned by Colonel Garstin [*see* Appendix D.], as having occurred to himself.

Proposed remedies.

91. The Commission, as a remedy, recommend, first, that all Commissaries of Ordnance be periodically informed of the value of all stores they are allowed to issue. The value must be shown in the receipts required from executive officers, and entered in the accounts without alteration; changes in the calculated cost of articles should not be noticed in an executive officer's accounts, unless he were made acquainted with the change when they were issued from the magazine.

2dly. The state and condition of articles returned to a magazine should be at the time declared. This might generally be settled by the parties without the intervention of a committee; but on the occurrence of any difference of opinion, the Commandant should at once order a committee, whose decision would be final.

Three states are at present recognized, "serviceable," "repairable," and "unserviceable." If the articles were returned in the first state, the executive officer would be entitled to a credit of the exact amount he was previously charged, without reference to any intermediate alteration in the calculated cost: if they were in the second state, he would be entitled to a certain fraction of the original value. At present it is believed that one-third is the fraction, which appears small; but practice must regulate the amount: if they were in the third state, a value must be agreed on by the parties, or they must be sold by auction for Government; but in all cases the value must be adjusted on the spot and at the time.

Suggestions for the better adjustment of accounts.

92. The immediate adjustment of accounts for stores received from magazine would allow of a complete "statement of differences" being given by the Accountant-General as soon as he had examined an executive officer's account current. This statement of differences should be final, and be deemed a perfect acquittance to the executive officer for all the disbursements included in the account current, and passed, as far at least that no further vouchers should at any future time be required for such disbursements, errors arising from fraud or intentional misrepresentation, being always liable to revision.

The comparison of the accounts current of officers, with the books and "counter accounts current" kept by the Accountant-General, sometimes brings to light items at the credit of an officer not claimed in his account.

The Commission are of opinion that all such sums should invariably be entered in the statement of differences furnished to executive officers in the same way as mistakes on the other side are shown. It is clear that such a course would frequently aid and accelerate the eventual adjustment of accounts, and never cause the loss of any money fairly due to Government, except through the dishonesty or fraud of the executive officer, an alternative which should not in this way be provided against.

Annual estimates for repairs.

93. The rules of the department require the transmission at one season of the year of estimates for all repairs, that the buildings, civil and military, may need, before any commencement is made. It has, consequently, become the practice to transmit "annual estimates" for the most trifling repairs. The Commission are of opinion that many buildings, particularly offices used only during the day, do not need regular annual repairs; and they would recommend that the limit, fixed at present at *Rs.* 25 for petty repairs (which may be executed without estimate) be extended, and the term be understood to include white-washing and all ordinary repairs; the same to be executed, when necessary, on the authority of the principal person in charge (whether civil or military). The economy of the work may still be tested and compared by entering in the bill the quantities executed, and applying to them the ordinary rates of such work in the division.

Periodical returns.

94. No particular objections have been raised to the periodical returns required from engineers, with the exception of the "annual valuation return of buildings," which is frequently a very long statement, differing year by year very triflingly.

It has occurred to the Commission that it would be sufficient to report any change in the value of the buildings that may have occurred during the year. This would enable the record office to make all the requisite alterations in their list.

But the general question of returns may more properly be taken up by the person entrusted with the compilation of the code of regulations. He should narrowly

narrowly examine the different returns, and propose amendments whenever they do not afford the required information in the most clear and succinct form.

Consideration of subjects by the Honourable Court of Directors.

95. In pursuance of the intention announced in the 3d paragraph of this Report, it remains to notice such of the subjects alluded to by the Honourable Court of Directors as have not been discussed in the preceding pages, and regarding which, the Commission have been able to obtain some satisfactory information; viz.—

The Grand Trunk Road;
The Agra and Bombay Road;
The Education of young Natives as Assistant Engineers.

The Grand Trunk Road.

96. In their remarks on the Great Trunk Road, the Court deduce a difference amounting to *Co's. Rs.* 87,83,797 between the original estimate for that work, and the aggregate of the actual expenditure, up to April 1848, together with thee stimates for the completion of what then remained to be done. On going over the calculation given on the margm of the Court's letter, the Commission discover an error amounting to 18 lakhs of rupees; thus—

Estimate of 1846 - - - - - -	*Rs.*	43,68,818	8 –
Spent in the three years succeeding - -	*Co.'s Rs.*	10,50,108	11 3
Estimate of Dec. 1848	„	1,03,02,507	– –
		1,13,52,615	11 3
Difference - - -	*Rs.*	69,83,797	3 3

Instead of *Rs.* 87,83,797, as above quoted.

But this excess may be still more materially reduced; for it was stated to the Commission by Major Willis [*see* Appendix F.] that the original estimate of 18 lakhs of rupees for bridging the Soane and the Jumna, as well as the subsequent one of 70 lakhs for the same purpose, were alike and avowedly mere guesses, and not based on data or calculations of any kind. Deducting the difference of these sums, or 52 lakhs, we have still to account for an excess of *Rs.* 17,83,797. 3. 3., to which the various causes enumerated in the 5th paragraph of the Court's despatch doubtless contributed; but the principal reason of the excess is the defectiveness of the original estimates, which were called for in a hurry (as stated by Major Willis), without time being allowed for preliminary inquiry. No sound estimate for such a work as the Grand Trunk Road could have been framed without previous survey and levels of the ground, and without ascertaining the volume and rapidity of the rivers, and drainage channels, the nature of the soil at the sites of bridges, &c. It appears that where proper estimates were framed, the calculated expenditure has not been exceeded.

Agra and Bombay Roads.

97. The Commission have had an opportunity of examining Major Abercrombie, who was for many years employed on the Agra and Bombay Road, regarding the excess of expenditure on that work beyond what had been contemplated by the Indian Government, and sanctioned by the Court of Directors.

It appears, from Major Abercrombie's statement [*see* Appendix F.], that the "projected expenditure" was fixed at *Rs.* 1,20,000, with no reference to any estimate framed by either of the officers appointed (successively) to construct the road, and that when the allotted sum was found insufficient to establish a line of communication passable for wheeled carriages during the dry season of the year, separate estimates for sundry necessary or advisable additions were submitted from time to time, and passed by the Government. It does not appear, therefore, that the excess of expenditure can in this instance be fairly attributed to the fault or neglect of any branch of the Public Works Department.

Framing of subordinate agency.

98. The deficiency, both in quantity and quality, of the subordinate agency has been already stated, and may be traced in a great measure to the want, until lately, of any adequate means of training candidates for the department.

The General Order, No. 144, of 10 July 1829, directing executive officers to admit and instruct apprentices, has been rendered practically inoperative, by the subsequent prohibition to appoint men belonging to the military service, and, as regards soldiers, it was only applicable at the stations occupied by the Honourable Company's European troops. Most of the assistant overseers have been supplied from

from the corps of Sappers and Miners, and acquired in the regimental school a sufficient knowledge of arithmetic, mensuration, and plain drawing, to pass them into the service. They had no practical knowledge of their duty as overseers, and were frequently ignorant of the only language understood by the labourers.

Colleges in the North-Western Provinces.

99. Previous to the establishment of the Roorkhee College for civil engineering in 1848, there was no training school for native assistant engineers. The Government colleges at Agra, Benares, and Delhi afforded, indeed, mathematical instruction (and at Agra a little surveying), but had no class for civil engineering, nor was the emolument given to native agents in the building department sufficient to command the services of educated men.

Hindoo College at Calcutta.

100. The class for natural philosophy and civil engineering in the Hindoo College at Calcutta has not fulfilled its object. The Professor, Mr. E. Sutcliffe [*see* Appendix N.], states, in reply to the Commissioners' inquiries, that his course of lectures, as prescribed by the Council of Education, embraces much which it is essential for a civil engineer to know, but does not touch the practical details of architecture. He mentions also, that the drawing and surveying class is but scantily attended, and attributes the want of interest felt in this branch of study to the absence of any certain inducement to qualify for the department of Public Works.

Civil Engineering College at Roorkhee.

101. The new college at Roorkhee has already afforded valuable aid to the department, and, on its present footing, is calculated to supply annually [*see* Appendix O.]—

4 Sub-assistant Engineers.
15 Assistant Overseers.
6 Senior native Agents, or Surveyors.
16 Junior native Agents, or Surveyors.

The course of instruction imparted to these men, and the opportunities they enjoy on the Ganges Canal Works, of forming a practical acquaintance with almost every description of engineering duties, give promise of a high standard of qualification for the public service.

Amount of increase required.

102. To test the sufficiency of the Roorkhee College as now limited, to supply the department generally with European overseers, the casualty list [in Appendix P.] has been obtained from the Military Board.

The average of vacancies for the last four years has been about 22 per annum; but the strength of the establishment is far below the wants of the service, and should be increased. The proportion between the senior and junior classes, which has been disturbed by the appointment of an unlimited number of assistant overseers, should also be restored. The following scale is recommended, and would not be found excessive:—

Conductors	15
Sub-conductors	20
Overseers	65
Assistant Overseers	200
TOTAL	300

According to the present ratio of casualties, there would, under the proposed organisation, be 33 vacancies per annum; but this might be slightly reduced, as "dismissals" will be less frequent as the preliminary qualification improves. The second class in the Roorkhee College might with advantage be doubled, and would then supply 30 overseers per annum, which would probably suffice.

Concluding remarks.

103. The Commission are aware that there may be minor points deserving of investigation, which they have left untouched in the foregoing Report. But the departure of Major Kennedy, and the consequent early termination of the inquiry, has obliged them to confine their attention to the more prominent features of the system. On these points they have spared no pains in arriving at sound conclusions, and have, therefore, had no hesitation in expressing decided opinions.

They cannot conclude without the expression of their unanimous and strong conviction of the unfitness of the Military Board, under any conceivable modification,

as

as a controlling or directing authority for the Department of Public Works, whether civil or military.

They are persuaded that any attempt of such a body to direct the department must produce the precise state of things now existing—dissatisfaction, irregularities, paralysis, extravagant cost, irresponsibility, and inexcusable delay, to a greater or less degree, in every branch of the department, with all the injurious consequences to the public interests, as well as to the individuals subjected to such a controlling authority.

(signed) *J. S. Kennedy,*
Major, Consulting Engineer to Government of India.

(signed) *W. E. Baker,*
Major Bengal Engineers.

(signed) *C. Allen,*
Bengal Civil Service.

Calcutta, the 5th March 1851.

MINUTE by the Most Noble the Governor-General of *India*.

1. IN obedience to the instructions of the Honourable Court of Directors, conveyed in their desptach, No. 2, 30th January 1850, a Commission was appointed to inquire into the system of superintendence and execution of Public Works in the Presidency of Bengal. The Department of Public Works in the Presidency of Bengal.

The Commission was composed of Major J. P. Kennedy, formerly an officer in the Royal Engineers, and who had recently been nominated by the Honourable Court to be Consulting Engineer to the Government of India; of Major Baker, a distinguished officer of the Bengal Engineers, and who has since succeeded Major Kennedy as Consulting Engineer; and, lastly, of Mr. Charles Allen, a member of the Civil Service, whose ability and experience specially recommended him to me as well fitted to take part in this inquiry.

2. The Commission sat at the Presidency. They were directed to report to the Government the result of their inquiry, and " to submit, for the consideration of the Government, any suggestions which they may think it expedient to make, either for the modification and amendment of the present system, or for the establishment of some other plan, whereby the execution of the Public Works may be placed under such a system as shall insure their being planned and executed with the utmost practicable amount of promptitude, skill, and true economy." A similar Commission was directed to be formed at each of the Presidencies of Madras and Bombay.

The Bengal Commission has submitted its Report, together with a voluminous Appendix, containing the returns, examinations, and correspondence connected with their inquiry.

No Report has yet been received either from Madras or Bombay; but I do not think it necessary to delay on that account the submission to the Honourable Court of the Report from the Bengal Commissioners, since the system which has for some time prevailed in this Presidency is to be judged by itself; and the plan which it is desirable to adopt for the future here is not likely to be affected in any way by the recommendations which the Commissioners at Madras or Bombay may make of arrangements suited to the circumstances of those Presidencies respectively.

3. The Commissioners have recorded the conclusion at which they have arrived in the closing paragraph of their Report.* They express an " unanimous and strong conviction of the unfitness of the Military Board, under any conceivable modification, as a controlling or directing authority for the Department of Public Works, whether civil or military."

* Para. 103.

" They are persuaded that any attempt of such a body to direct the department must produce the precise state of things now existing—dissatisfaction, irregularities, paralysis, extravagant cost, irresponsibility, and inexcusable delay, to a greater or less degree, in every branch of the department, with all the injurious consequences to the public interests, as well as to the individuals subjected to such a controlling authority."

It is unnecessary for me to introduce at length into this Minute the grounds on which the Commissioners have based their unanimous and decided opinion. The

facts which they recite, their observations and arguments, are clearly and forcibly stated in the body of the Report, and could not be condensed without weakening their statement of the case.

4. Their conclusion, founded on the facts they have collected, and on the inferences to be drawn therefrom, are fully concurred in by every authority in the land.

The Honourable the President in Council testifies to the inconvenience which is felt to arise from the existing system in the department, to the delay in the preparation of works and their estimates, and to the still greater delay in the subsequent adjustment of accounts.

Para. 42. The Government of Bengal declares the instances of inconvenience and mismanagement under the present system to be so numerous, that the collection of them could not be completed at the date of the Report, and it has only lately been submitted, after some five months' labour.

From Bengal, No. 991, dated 24 June 1851. The Deputy-Governor complains of "public money wasted, of the public convenience having been compromised, and life and property over an immense tract of country having been endangered by the neglected state of the embankments and roads;" and his Honour concludes by the expression of his opinion, that the "present system is, in fact, very wasteful and inefficient."

Para. 43. The Lieutenant-Governor of the North-Western Provinces observes, that four years ago he pointed out to the Supreme Government the "necessity of a thorough change in the conduct of Civil Works;" and he adds, that the experience of the intervening years has strengthened the convictions he then expressed.

His Honour enforces this opinion by observations on the mode of control, and on the mischievously complicated system of accounts, and cumbrous detail of checks in the department.

5. Begging that the Honourable Court may distinctly understand that I do not advocate the abolition of the Military Board, I desire to record my entire concurrence in the opinion expressed by the Commission on Public Works by the President in Council, by the Deputy-Governor of Bengal, and by the Lieutenant-Governor of the North-Western Provinces, respecting the inexpediency of any longer entrusting to that Board the charge of Public Works.

I am and have long been convinced, that the existing system of management in the Public Works is altogether unsound, and that the Military Board is not merely ill adapted, but is entirely unfit to be entrusted with the control of that most important branch of the Government of India.

6. Charged with the direction of the enormous department of Public Works, of the Army Commissariat, of the Government Studs, of the Ordnance, and therein of the Foundry, the Gunpowder Manufactory, the Gun Carriage Agency, and the Arsenals, as well as of the military equipment of the Army, excepting only its clothing; charged, moreover, with the account and audit of the expenditure of these several departments, as well as with the executive direction of them; it is physically impossible that the Military Board, even if it were selected and constituted with the utmost care, could satisfactorily conduct so huge and unmanageable a mass of public business, or could get through it at all without those delays which have made the very name of the Board a bye-word throughout India, and which are equally harassing and injurious to the officers of the department, to the Government of the country, and to the public interests.

7. The constitution of the Board itself is ill adapted to render it capable of coping with such formidable duties as have been imposed upon it.

Until very lately the chief magistrate of Calcutta was one of the four persons who had to perform the multifarious functions I have just enumerated: that anomaly was got rid of.

The Board is now composed of three *ex-officio* members, namely, the Chief Engineer of the Army, the Brigadier commanding the Artillery, and the Commissary-General; to these is added one Stipendiary Member, who is an officer of the Cavalry or Infantry.

It is obvious, at the first glance, that a Board so constituted, is in no respect adapted for the consideration and disposal of questions connected with a great department of Public Works of every description, or for the efficient direction thereof.

The

The Chief Engineer of the Army, indeed the head of that most capable and distinguished body of men, the Engineers of the Bengal Army, will in all probability be qualified to fill the position he occupies.

But the Brigadier commanding the Artillery attains that position solely by the strength of living long enough. Under the present system, which I trust before long to see abandoned, in appointing to the command of the Artillery, as well as to every other high command in the Army, the senior officer becomes Brigadier of Artillery, as a matter of course, unless there be some notorious incompetency, or some scandalous deficiency of character to exclude him.

He must be an old man; he may be a very good and efficient officer; but there is no security whatever against his being a very stupid and useless one.

The Commissary-General is usually the officer who may have stood senior in that department.

The Stipendiary Member is at present a Lieutenant-colonel of Cavalry.

8. Whichever of these members be selected as the trial who have immediate charge of Public Works, the deficiency in the constitution of the Board is equally palpable. As the Commissioners justly observe, "the qualifications required in a member for one branch of the business," and, perhaps, possessed by him in a high degree, "are no guarantee of fitness for the others;" the result is, that, as far as the Department of Public Works is concerned, "every important question that comes before the Board will be discussed by one qualified and two unqualified members." Para. 46. Para. 46.

From the concurrence of the unprofessional members, the opinion of the Chief Engineer "receives no additional weight, while by their dissent it is liable to be set aside. In the one case, the engineer does not fully bear the responsibility of acts and opinions originating with himself, while, on the other, he is saddled with that which by no means belongs to him." Para. 67.

9. The objections to leaving the management of Public Works any longer in the hands of the Military Board, which are to be found in the physical impossibility of their efficiently controlling so great and varied a mass of public business as has been committed to them, and in the faulty constitution of the Board itself, are greatly increased by the geographical position it occupies in the Provinces over which its departmental control extends.

The inconveniences arising from the Board being placed at almost the extremest corner of the Presidency, thus compelling the communications of their officers, and those in reply, to travel over the greatest possible distance, and to consume the longest period of time, are obvious; they are illustrated by the Commissioners in the 38th paragraph of their Report.

These, and the other evils connected with the present constitution of the Board, impressed themselves very early on my notice after my arrival in India. And now, after an experience of three years and a half, I have no hesitation in recording formally my conviction, that the faulty constitution of the Military Board for the conduct of the Department of Public Works; the want of any practical knowledge of the details of Public Works in all the members, except the Chief Engineer; the protracted delays in commencing any work, which are universally complained of, and which have compelled me in many instances in the new Province, where shelter for troops, and consequently men's lives were distinctly involved, to issue orders on my own responsibility; the needless and harassing minuteness of regulation and check which is deadening to the energy and obstructive to the usefulness of officers, while at the same time it has been ineffectual as a safeguard for the interests of the Government; and, lastly, the endless procrastination in the settlement of the public accounts, have long since destroyed all confidence in the department, and have satisfied me that a total and fundamental change is indispensably necessary.

10. The Commissioners allude to various modifications which have from time to time been proposed by various authorities, and conclude their Report by suggesting the general outline of a scheme for the future management of the Department of Public Works.

I entirely approve of the general features of that scheme; and I conceive that the Honourable Court will confer a substantial benefit on these territories, and on the officers of the department, and will materially serve the general interests of the East India Company, if, in compliance with the very earnest recommendation

which I have now the honour to submit to them, they shall authorise me forthwith to establish the new system in the Presidency of Bengal.

11. The objects to be held in view in the establishment of such a system are these:

I. To secure the best professional advice and guidance for the authorities of the State in regard to the construction of Public Works, both military and civil.

II. To impose as far as possible direct responsibility on every officer of the department, whether he advises, controls, or executes.

III. To provide for the prompt transaction of business connected with public Works between the officers who have charge of those works, and the Government which sanctions or directs them, so as to avoid all undue delay in the commencement of necessary undertakings, and to ensure the steady conduct of them afterwards.

IV. To establish a system of timely repairs on Public Works already constructed, without the delays and difficulties which are now interposed by existing rules.

V. To institute such rules as shall ensure that when a Public Work has been sanctioned, its probable cost to the treasury may be ascertained by previous careful estimate; that the executive officer shall be able to give his full attention to directing and checking the work during its construction; that the sufficiency of the work, and its correspondence with plans, shall be certified by competent authority on its completion; that the cost of the work shall be in due correspondence with the estimate, without insisting on such minute correspondence as is not indispensable, and is of no practical advantage to the State; and, finally, that the account of expenditure on the work shall be regularly adjusted, and, after its completion, shall be speedily closed.

12. The Honourable Court can command within its own services the means of attaining in the best manner each of these objects.

I. The most able advice and guidance in regard to Public Works will be secured by selecting one or more officers of engineers, whose pre-eminence in a body of men trained by education and by the practice of their lives to such professional undertakings, points them out as best qualified to direct the Government regarding such Works.

II. Direct responsibility will be imposed on every officer; careful previous consideration of the professional opinions he gives, and active supervision of the undertakings commenced under his advice, will be obtained by not associating him, as at present, with other functionaries, whose opinions add no weight to his, while they may numerically outvote it.

III. The prompt transaction of business will be provided for, by establishing, instead of a collective Board for the whole Presidency of Bengal, one consulting officer for each of the Local Governments into which that Presidency is now practically divided.

IV. and V. The institution of a system which shall ensure regularity of timely repairs, careful estimates, prompt execution, and full information as to regular and steady progress of works, will be the certain result of that better organization of the directing authority which I have proposed above; while the means of control and active inspection on the part of the executive officer, the check and speedy adjustment of his accounts, will be obtained by the separation of the accountant from the executive duties which the Commissioners so strongly recommend, and the advantages of which have been so fully proved in the Canal Department Office.

13. I have respectfully to submit for the consideration of the Honourable Court the following sketch of arrangements which I take the liberty of recommending for their adoption:

I. The Military Board shall be relieved of all authority over or concern with the Department of Public Works.

II. In order to establish a system of control over Public Works, wherein the duty may be carried on with promptitude, energy, and accuracy, the existing Local Governments in the Presidency of Bengal, that is to say, the Governor, or Deputy

Deputy Governor, in the Lower Provinces, the Lieutenant-Governor in the North-West Provinces, and the Board of Administration, or any chief authority which may be substituted for the Board, in the territories beyond the Jumna, shall be invested with administrative authority over both Civil and Military Works. The power and discretion of the Local Governments shall be limited by the same restriction as at present in respect to new projects, and to any question of consequence that may arise. Until the great mass of new military buildings in the Punjab shall be completed, it may perhaps be desirable that the immediate control of them should remain, as at present, in the hands of the Governor-General in Council. Para. 73.

III. Under each of the three Local Governments an officer shall be appointed who shall discharge all those functions in regard to Public Works which are now performed by the Military Board. Each of these three officers shall be selected from the corps of Engineers, or from the officers of the Department of Public Works, or from any branch of the service, provided always that the selection of such officer shall be founded on his professional eminence, and on his peculiar fitness for being the responsible adviser of the Government in all matters connected with Public Works.

In order to avoid unnecessary changes in designation, these officers should be termed respectively the Chief Engineer of the Lower Provinces, of the North-West Provinces, and of the Punjab.

The office of Chief Engineer of the Army should be abolished.

Each Chief Engineer will be in direct communication with the Local Government under which he is placed, and will be stationed permanently at the seat of Government, unless when circumstances connected with any important work, or with the management of the department generally, may require him to visit specially any work or place.

IV. Each Chief Engineer shall be assisted by two or more Deputies, who shall be termed Superintending Engineers, and who shall perform the same duty of supervision of the executive officers in their several charges as Superintending Engineers at present perform.

Whether these officers should remain with the Chief Engineers, or should be stationed at distinct points, with a stated round of superintendence, are matters of detail which may be better adjusted hereafter.

As a general rule, they should not be the medium of correspondence between the executive officers and the Chief Engineer.

V. The territories under each Local Government shall be divided into compact and manageable districts, each under an executive officer, as at present.

The Commissioners have very satisfactorily shown that it will be for the public interests that each Executive Engineer should have charge both of the Civil and Military Works in his district. Para. 74.

VI. The conduct of business in the department would not differ essentially from the mode in which it is carried on at present.

On sanction being given to the preparation of any work by the Local Government, the Executive Engineer shall prepare plans and estimates, as at present, in the detailed form suggested by the Commissioners, and he shall transmit them to the Chief Engineer under whom he is placed.

The Chief Engineer shall examine and check all calculations, and shall submit the result to the Government to which he is attached.

If the work is so limited in its extent as not to require a reference to the Supreme Government, the Local Government, on approving the plan, estimate, &c., shall direct the work to be commenced.

If the magnitude of the work should require a reference to the Governor-General in Council, sanction may be given by the Governor-General in Council at once; or if any doubt or difficulty should be felt to exist, the Governor-General in Council will have it in his power to seek the opinions of the several Chief Engineers on the scheme, and to take advantage of the advice of the Consulting Engineer to the Government.

On final sanction for the commencement of the work being received by the Executive Engineer, he will proceed to the construction thereof.

The supervision of the progress of the work will be exercised by the Superintending Engineer at such periods and in such manner as the Chief Engineer may direct.

The existing system of completion surveys by a committee of officers is worse than empty form.

The inspection of any completed building, which is not so unimportant as that it may be properly left to the certificate of the Executive Engineer himself, shall be made by a Superintending Engineer, by several Superintending Engineers, or by the Chief Engineer, according to the importance and value of the work.

Under this system, the Government will have a far better guarantee for the efficient discharge of the duties of executive officers, and for the substantial and economical construction of Public Works, than by the mode of committee survey, which is as yet in practice.

VII. In regard to that most important and difficult branch of the Public Works Department, the rendering and audit of accounts, I heartily commend to the consideration and sanction of the Honourable Court the several recommendations of the Public Works Commissioners.

The nature of the facts which have come before me, the universal testimony of every officer in the department, of whatever degree, and the conclusions of my own judgment, have long since satisfied me, that it is utterly impossible that the various duties of an executive officer can be properly performed unless a separation shall be made between the strictly engineering duties and those of book-keeping. This portion of the subject is fully and conclusively treated in the 79th and other paragraphs of the Commissioners' Report.

If this most necessary change shall be sanctioned, there will be no obstacle to the monthly rendering of bills recommended by the Commissioners in paragraph 80, and to their immediate audit.

The audit shall be made by the Chief Engineer of all "authorised expenditure, whether on works, repairs or establishments, under such regulations and with such limitations of discretion as may be deemed desirable. He will forward all audited bills for adjustment to the office of the accountant, whose duty it will be to see that he has not exceeded his powers."

Para. 75.

14. For the present, I abstain from entering on the question of contracts, the necessity, or at least the expediency of affording some relief to the executive officers in regard to the details of barrack management, and other minor matters to which the Commissioners have adverted in their Report, judging it better to confine myself exclusively to the leading features of the system which the Commissioners have proposed to substitute for the present management of the Military Board.

15. Under the operation of the system proposed, the inconvenience now so sensibly felt, from the enormous territory included in the Presidency being superintended by a single departmental authority at one extremity of it, will disappear.

The administrative authority over works, both civil and military, will in each Local Government be placed under the guidance of the person or persons best acquainted with the country, its circumstances and wants; while the same wholesome control over new projects and expenditure as now exists, will still remain with the Supreme Government.

The chief departmental authority in each of the three Governments will be able to obtain that personal knowledge of the works, and of the districts under his control, which the Military Board could never command.

The abolition of the Superintending Engineer's office, as an intermediate communication between the executive officers of the department and its chief, will quicken the transaction of business, lessen the bulk of record, and diminish its expense, while it will leave the Superintending Engineer disengaged for that work of superintendence which his designation indicates as his principal duty.

The several improvements suggested in the position of the Executive Engineer will set him free, as now he is not, to act in his proper sphere, will ensure an accurate periodical record of the progress of works, and of their actual progressive cost, and will relieve the Government from the risk, and the responsible officers from the misery, which are the necessary consequences of protracted delay in the adjustment of public accounts.

16. It remains for me to consider what will be the additional charges to the State which will be created by the introduction of the system now proposed.

If

If the office of Chief Engineer of the Army shall be abolished, the substitution of three Chief Engineers in the Department of Public Works for the control of the Military Board will not involve any serious expense.

The tenor of the Commissioners' Report leads me to conclude that any re-distribution which may be made of Superintending and Executive Engineers in the department, will not add to the actual number of officers now serving in it, or to the cost.

The addition of an accountant to the office of each Executive Engineer, or to one or more adjacent executive officers, must necessarily impose an additional charge on the Treasury in the first instance; but I feel very confident that the saving which will be effected by means of the additional and closer oversight which the Executive Engineer so relieved will be enabled to give to the progress of Public Works under his charge, will annually repay fivefold the increased outlay which the introduction of accountants will involve.

17. One branch of increased expenditure is indeed inevitable; but it is not caused by the proposed alteration of the system; it must be incurred, whether the control of the department of Public Works remains with the Military Board, or is transferred in the mode which has been suggested. The Honourable Court of Directors have some time ago intimated their conviction of its necessity; they have informed the Governor-General in Council that they are ready to take into consideration the suggestions he may think it expedient to submit to them for an augmentation of the officers of the Engineer corps.

18. I fully concur with the Commissioners in their remark, that it is not "desirable that the Department of Public Works should be closed against qualified officers from any branch of the service." But the Commissioners, in their preceding paragraph, inform me, that it is shown by a Return they had called for, that of 95 appointments in the department, 48, or more than half, are filled by officers not belonging to the Engineer corps. Para. 58.

Moreover, with few exceptions, the companies of Sappers and Pioneers are all commanded by infantry officers.

The proportion stated above is manifestly too large; some addition to the Engineer corps is indisputably necessary.

The Honourable Court having recently sanctioned the establishment of 12 companies of Sappers, the whole of these should be commanded by officers of Engineers. Every young officer of Engineers on his arrival should be posted to the Sappers, where he should be retained until he shall have acquired those qualifications in knowledge of the native language, &c., which are indispensable to his usefulness in this country; nor should he be entrusted with any separate charge, except under very special circumstances to be set forth, until he shall have gone through a sufficient probation under a senior and experienced officer in executive charge.

For this purpose, and in order to relieve the other branches of the service from that undue withdrawal of officers from the several corps which the public interest at present compels the Government to resort to, an increase of the Engineer corps appears to me to be indispensable.

19. I have not hitherto acted on the permission of the Honourable Court to address them on that subject, because I was desirous before doing so of ascertaining, by experience, as nearly as possible what permanent increased demands in the Department of Public Works would be caused by the annexation of the new province beyond the Sutlej.

The Commissioners unfortunately have not entered into any detail on the subject. I propose now to require an opinion on that head to be prepared at the Presidency, and submitted to me.

It shall be laid before the Honourable Court as soon as I shall have received it.

20. In the meantime, I have resolved to submit to the Court the general question of the re-organization of the Department of Public Works, without waiting for the detail of the proposed augmentation of Engineers, which, as I have already said, is a question altogether separate from any proposal for a change of system.

I shall request my honourable colleagues at the Presidency to record such observations as they may desire to offer to the Court.

The clear and full Report of the Commissioners, and the body of evidence and of information collected in the Appendix, together with the views of the Supreme

Government, which will be contained in the several minutes of its members, will enable the Honourable Court to form their decision on the large question which has now been laid before them.

21. I will not trouble the Court by recapitulating the several recommendations of the Commissioners and of myself, but will simply express my anxious hope that the Court will see good grounds for granting their sanction to the immediate adoption and practical introduction of the system which has now been proposed for the management of the Department of Public Works in the Presidency of Bengal.

24 July 1851. (signed) *Dalhousie.*

(True copy.)

(signed) *J. Stuart,*
Colonial Secretary to Government of India,
Military Department, with the Governor-General.

(True copy.)

(signed) *J. S. Banks,*
Officiating Secretary to the Government of India,
Military Department.

MINUTE by the Most Noble the Governor-General of India.

Augmentation of Engineers.

1. I WISH now to transmit to the President in Council a minute which I have recorded on the Report submitted by the Commissioners of Inquiry on the Public Works Department.

The minute will itself convey to his Honor my views on the important questions discussed in the Report.

2. It is very desirable that the Report, and the opinion of the Supreme Government regarding it, should be laid before the Court without delay.

I have, therefore, the honour to request that the President and the members of Council will be so good as to add to my minute any record of their own views that they may wish to make; and that they will despatch them with the Report to the Honourable the Court of Directors.

The Appendix is extremely voluminous; much time will be consumed in copying it; and the papers contained in it are not necessary for the consideration of the Court—at all events in the first instance. It will, therefore, be advantageous to forward the Report and the Minutes at once, transmitting the Appendix by a subsequent mail.

3. The Commissioners, in their Report, have not entered upon the consideration in detail of the re-distribution of districts and charges, to which they have incidentally alluded.

The mere transfer of controlling authority from the Military Board to a Chief Engineer in each of the three territorial divisions of the Presidency of Bengal, does not necessarily involve any change at all in the division of executive charges.

It may be well, however, to take this opportunity of revising the distribution of charges, with a view to modifying them, or making such changes in them as may be practicable and convenient.

4. The addition to the Engineer corps, which is obviously indispensable to some extent, ought now to be considered and determined, so far as this Government is competent to do so.

The Commissioners appear to me to take a very sound view of the case, when they state their opinion, that the Department of Public Works ought not to be closed against qualified officers belonging to other branches of the service, but that the number of such officers at present holding offices in the department is disproportionately large.

5. Besides the stated charges of executive officers, whose numbers are hereafter not likely to vary, there is a very large demand for qualified officers, arising from the

the works on the Ganges Canal, on the Baree Doab Canals, and on the large extent of roads now in progress, both in the old and new Provinces. The survey occupies some. The 12 companies of Sappers are hereafter to be officered exclusively by the Engineers; and there are other incidental demands now occasionally arising, which will, no doubt, continue to arise.

It is true that in 1854, if the expectations at present entertained are fulfilled, a good many officers will be set free by the completion of the works on the Ganges Canal. But by that time other works of a similar character, and equal utility, will, I hope, have been undertaken, demanding the services of skilled officers.

6. I apprehend, therefore, that the number of officers employed in the Department of Public Works is not likely to be less hereafter than it now is. It has been shown that the numbers of the Engineer corps are quite inadequate to supply the present demand. It has also been laid down that it is not desirable that the corps should be placed on such a footing as to be adequate to supply the demand fully, but that some openings should be left for qualified officers in other branches of the service.

I cannot venture to pronounce an opinion as to the precise addition which ought to be made to the Engineers. As at present advised, I conceive that the numbers of the corps (after deducting a due proportion for officers sick, absent on leave, and, in a small degree, for officers who may be politically employed), ought to be made sufficient to supply the Sappers and their staff, all the fixed and regular establishment of executive charges, and perhaps half the number of appointments, exclusive of the executive charges which are connected with canals, roads, &c.

I throw this out merely as a suggestion, subject to correction and amendment.

7. The question must, however, be entered upon, in order that some specific plan may be laid before the Government.

The departure of Major Kennedy has broken up the Commission, so that the subject cannot be referred again to it.

The best plan which suggests itself to me is, to request the President in Council to refer the question of revision of charges, and increase of the corps of Engineers, to Major Baker, who was a member of the Commission, and is now a consulting engineer to the Government.

8. The consideration of that officer should at the same time be given to the arrangements which will be requisite for adding accountants to the present establishment, if that valuable improvement should be sanctioned by the Court. The expense of such addition should be also calculated.

It appears to me to be worthy of consideration, whether an accountant's office for several adjacent charges might not be substituted for the proposal of adding an accountant to each separate charge; such an establishment would, I conceive, be not less efficient than the other, while it would certainly be less costly as a whole.

9. In considering these details of the Commissioners' scheme, Major Baker may be empowered to consult with, and to obtain the aid of, the Chief Engineer, and of other officers in the department.

(signed) *Dalhousie.*

26 July 1851.

(True copy.)

(signed) *J. Stuart,*
Colonial Secretary to the Government of India,
Military Department, with the Governor-General.

(True copy.)

(signed) *J. S. Banks,*
Officiating Secretary to the Government of India,
Military Department.

MINUTE by the President of the Council of India.

Department of Public Works.

THE whole subject connected with the present superintendence and executions of Public Works, seems to have been carefully inquired into, and reported upon, by the Commission appointed for the purpose.

Their condemnatory views of the existing system are coincided in by every other authority that has been consulted.

Experience has, in fact, long ago proved the present system to be radically bad, and I have no expectation that amendment is practicable by any re-organization of the Military Board.

I therefore concur in the necessity of removing the whole Department of Public Works from the superintendence and control of the Military Board.

I have attentively considered the plan proposed by the Governor-General, which appears to me admirably adapted to secure success to the future management of this most important department; and I have only to express my entire concurrence in the views expressed and detailed in his Lordship's minute.

I feel satisfied that if the approval of the Honourable the Court of Directors be accorded to this plan, proposed in substitution of the present system, the result will be of immense importance to the Government interests and the public good.

(signed) *J. H. Littler.*

21/8/51.

(True copy.)

(signed) *J. S. Banks,*
Officiating Secretary to the Government of India,
Military Department.

MINUTE of the Honourable Sir *F. Currie*, Bart.

REPORT of the Commission to inquire into the working of the Department of Public Works and Court's Despatch, regarding Increase to the Corps of Engineers.

I ENTIRELY concur with the Most Noble the Governor-General in the remarks and propositions contained in his Lordship's minutes, dated 24th and 26th ultimo, which are, for the most part, in accordance with the suggestions of the Commission. I have long felt the pressing necessity for extensive reform in the administration of this department of the Government, and the expediency of removing the department altogether from the control of the Military Board, which, from its locality and its constitution, as pointed out by the Governor-General, and from the overwhelming multitude of its other duties, would not, under any circumstances of individual efficiency, exercise an efficient superintendence, guidance, and check over this very important department, in which there has consequently been of late years (as I doubt not in former) a most wasteful expenditure of enormous sums of Government money, without providing in anything like a sufficient manner for the execution of necessary works of public utility.

I have no doubt that, if the present suggestions be adopted, three times as much work as has hitherto been performed will be accurately executed at a much less cost than has hitherto been charged in this department to the expenses of the State.

I would not exclude persons who do not belong to the Engineer corps altogether for the more important offices of the department, though it is only, I think, in rare instances that officers of the army who have not enjoyed the advantages of a scientific education are capable of doing full justice to their duties.

(signed) *F. Currie.*

23 August /51.

(True copy.)

(signed) *J. S. Banks,*
Officiating Secretary to the Government of India
in the Military Department.

MINUTE by the Honourable *J. Lowis*.

Department of Public Works.

I CONCUR in the views expressed in the minutes recorded, on the 24th and 26th ultimo, by the Most Noble the Governor-General, regarding an organic change in the Department of Public Works, and the desirableness of a considerable increase to the corps of Engineers.

That the existing system works very badly is notorious to all who have in any way had to do with it. To those who have had opportunity of observing its internal machinery, it is matter of surprise, not so much that it works badly, as that it works at all; and I am clearly of opinion that nothing short of the radical alteration suggested by his Lordship will suffice to place the department on a sound footing.

But it is fair to the many meritorious officers employed in the department to say, that the fault lies in the system, and not in them. Illimitable waste of time, and incalculable waste of labour, vexatious interference, and the performance of heterogeneous duties, checks upon the expenditure which are fallacious, and completion reports which are delusive, are some of the hindrances and temptations to which they are exposed. These appear to be inherent in the present system, and, in spite of the honest exertions of the majority of the officers employed, they have, without question, entailed vast loss and injury upon the community and the Government, and must continue to do so, until the proposed change, or some other as comprehensive, is carried out.

The proposed arrangements appear to me to be excellently calculated to secure the ends in view; they will save time and abridge labour, obviate interference, and give unity to duty, and create a real responsibility, by securing a valid check upon expenditure, and getting completion reports from officers who know something about what they are reporting upon.

I have no doubt that a large aggregate saving will be the result of this change, and I would run no risk of failure anywhere by under-officering the department, but would press upon the Honourable Court the adoption of the plan in its integrity, without any delay.

(signed) *J. Lowis.*

25 August /51.

(True copy.)

(signed) *J. S. Banks,*
Officiating Secretary to the Government of India,
Military Department.

MILITARY LETTER from the Court of Directors to the Government of Bengal, dated 3d March 1852, No. 25.

REPLY to Letter dated 2d September 1851, No. 141.

Report on the Department of Public Works, Civil and Military.

Para. 1. PURSUANT to the instructions given in our letter in the Public Department, dated the 30th January 1850, a Commission was appointed by you in December of that year to inquire into the system of superintendence and execution of Public Works in the Presidency of Bengal.

2. This Commission was composed of the following officers; viz.—

Major J. Pitt Kennedy, H. M. S., Consulting Engineer to the Government of India.
Major Baker, Bengal Engineers.
Mr. Charles Allen, Bengal Civil Service.

3. Their Report bears date the 5th March 1851.

4. After a most careful and elaborate inquiry, the Commission have reported unanimously and decidedly against the continuance of the present system of superintendence of Public Works by the Military Board.

5. It has long been apparent to us that the magnitude and multiplicity of the executive and controlling duties confided to the Military Board were greater than could

could properly be discharged by that Board. We have, in consequence, cordially approved of the measures which have been taken from time to time for detaching a member of the Board to attend on the Governor-General when absent from the Presidency, in order that the Governor-General might be enabled to deal promptly with questions which would otherwise have required a reference to the Military Board, involving great and injurious delay. We have also cordially approved of the Governor-General having ordered, on his own responsibility, the execution of military buildings and other works in the Punjab, and so avoided the loss of time which the distance of 1,000 miles from the Presidency and the forms of office would have necessarily entailed.

6. It is now in the last degree important that arrangements should be made for securing the prompt and efficient discharge of the duties devolving on the department of Public Works, and we view with much satisfaction the Report of the Commission, as containing results and proposals which we trust will enable your Government to accomplish this great object.

7. Without encumbering this despatch with all the details which have led to the results now before us, we will proceed at once to announce to you our approval of the following measures, as proposed by the Commission, and unanimously recommended by the Governor-General, by the Deputy Governor of Bengal, and by the Members of Council.

8. The Department of Public Works, civil and military, to be removed from the superintendence of the Military Board, and placed under the administration of one officer in each of the three great divisions; viz.—

1st. The Lower Provinces;

2d. The North-Western Provinces;

3d. The Punjab, including the territories beyond the Jumna;

to be designated Chief Engineer of those divisions respectively.

Each Chief Engineer to be in direct communication with the Local Government under which he is placed, that in the Punjab being for the present the Board of Administration; and to discharge, under the orders of those authorities respectively, the same functions of check and control within his division as are now entrusted to the Military Board.

Each Local Government to be entrusted with administrative authority over both Civil and Military Works; but, except within certain limits of expense, to be hereafter fixed, the power of sanctioning new works to be restricted, as at present, to the Governor-General in Council.

Each Chief Engineer to be assisted by two or more deputies, designated Superintending Engineers, who shall perform the same duty of supervision of the executive officers in their several charges as superintending engineers at present perform.

The territories under each Local Government to be divided into compact and manageable districts, each under an executive officer, as at present.

9. Under these arrangements, the separate office of Chief Engineer, as at present constituted, will become unnecessary, and will be abolished on the next vacancy, leaving for future consideration such arrangements as may be required for the general conduct of business connected with the engineers as a corps of officers. The officer now holding the office of Chief Engineer, who will be relieved from the duties of the Military Board, will be available for the important duties of Chief Engineer of one of the new divisions.

10. We entirely approve of the suggestion that the establishment of Executive Engineers shall be strengthened by the addition of a well-qualified accountant, so as to enable the Engineer to devote his principal attention to the engineering duties confided to him. It is our intention to cause our engineer officers, under instruction at the Royal Engineer Establishment at Chatham, to go through a course of book-keeping, in order the better to qualify them to supervise the accountants in the performance of their duties.

11. We would call your especial attention to the valuable suggestions of the Commission on the subject of contracts for Public Works, as contained in paragraphs 82 and 84 of their Report.

12. The

12. The arrangements now authorised may, as observed by the Governor-General, be expected to produce the following important advantages:

"The inconvenience now so sensibly felt from the enormous territory included in the Presidency being superintended by a single departmental authority at one extremity of it, will disappear.

"The administrative authority over Works, both civil and military, will, in each Local Government, be placed under the guidance of the person or persons best acquainted with the country, its circumstances and wants; while the same wholesome control over new projects and expenditure as now exists, will still remain with the Supreme Government.

"The chief departmental authority in each of the three Governments will be able to obtain that personal knowledge of the works, and of the districts under his control, which the Military Board could never command."

13. We shall look with much interest for the detailed arrangements which you may propose to adopt to ensure the energetic and effectual carrying out of the new system.

14. We await the receipt of your matured opinions as to the increased number of engineer officers required for the public service. Meanwhile we shall continue to commission as engineers from our military seminary all those cadets who have fully qualified themselves for that branch of the service according to the established test.

15. We cannot conclude this despatch without expressing our satisfaction at the manner in which the Commission on Public Works discharged the duty confided to them.

The Reports of the Commissions of Inquiry on Public Works at Madras and Bombay have not been received.

Philip Melvill,
Secretary Military Department.

East India House,
the 22d April 1853.

PUBLIC WORKS (BENGAL, &c.)

COPIES of the REPORT of the COMMISSIONERS on PUBLIC WORKS at *Bengal*, in the Year 1851–52, with the Minutes of the Members of the Government and of a Despatch of the Court of Directors, relating thereto.

(*Mr. Hume.*)

Ordered, by The House of Commons, *to be Printed*,
27 *April* 1853.

407.

Under 8 *oz.*

PUBLIC WORKS (BENGAL, &c.)

FURTHER RETURN to an Order of the Honourable The House of Commons, dated 24 February 1853;—*for*,

COPIES "of the REPORTS of the several COMMISSIONERS on PUBLIC WORKS at *Bengal*, *Madras*, and *Bombay*, in the Year 1851–2; of the MINUTES of the Members of the Government thereon; and of any Orders or Despatches of the COURT of DIRECTORS relating thereto."

East India House,
26 May 1853.

JAMES C. MELVILL.

Note.—The Report of the Bengal Commission has been presented to the Honourable the House of Commons; that of the Commission appointed at Bombay has not yet been received in this country.

(*Mr. Hume.*)

Ordered, by The House of Commons, *to be Printed*,
27 *May* 1853.

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T. L. Peacock,
Examiner of India Correspondence.

FIRST REPORT of the COMMISSIONERS appointed to inquire into and report upon the System of Superintending and Executing PUBLIC WORKS in the *Madras* Presidency. Submitted to the Right honourable the Governor in Council of *Fort St. George*, on the 23d December 1852.

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NOTIFICATION.

For convenience sake, the concluding Section of the Report contains a Recapitulation of the contents of the preceding Sections.

A Glossary of Indian Terms will be found after the Appendix.

FIRST REPORT

OF THE

MADRAS PUBLIC WORKS COMMISSIONERS.

Section I.

INTRODUCTION.

Recital of appointment and instructions.

1. In pursuance of instructions from the Honourable the Court of Directors, conveyed in their despatch to the Government of India, dated 30th January 1850, the Right honourable the Governor in Council was pleased, in the Extract from Minutes of Consultation, Public Works Department, 17th February 1851, No. 57, to constitute us a Commission to inquire into and report upon the system of Public Works in this Presidency. By the same order we were empowered to call on all departments and individual officers for information connected with the subject of our inquiries; and by a subsequent order (21st March, No. 109), we were authorized to call before us, and examine *vivâ voce*, any persons in the service of Government whom we might think it necessary so to examine. In this latter order, and in a memorandum, dated 22d March, the particular objects for the inquiries of the Commission were pointed out with more detail. We give those orders in full in the Appendix (A.), and it does not seem necessary to refer to them more particularly in this place.

Assembling of the Commission.

2. Agreeably to our appointment, we met in Fort St. George, on the 21st March 1851, and commenced our proceedings.

Subjects of inquiry.

3. According to the terms of the Honourable Court's despatch, para. 65, our inquiries were to embrace " the whole subject of the superintendence and execution of Public Works" under this Presidency. Those works are carried on under three distinct and independent departments; viz. 1st. The Public Works Department of the Board of Revenue. 2d. The Superintendent of Roads. 3d. The Military Board.

The Board of Revenue has the control of all irrigation works, all civil buildings in the provinces, and all roads and bridges, not included in the " Trunk Roads," or in military cantonments, and all canals, &c.

The Superintendent of Roads has the sole superintendence of the great lines of communication which have been classed under the term Trunk Roads: he proposes all new roads on these lines, as well as all repairs and improvements, and he and his subordinates execute the greater part of the work.

The Military Board have the superintendence of the construction and repair of fortifications; of all public buildings, both military and civil, at the Presidency; the Government roads, and all bridges at the Presidency; all military buildings and forts in the provinces; and roads and bridges, &c., in military cantonments, as well as the roads, bridges and civil buildings and works in the Saugor Division. Besides these, the work at the Paumbum Channel is under the sole superintendence of the Chief Engineer.

Sources of information.

4. Our inquiries naturally followed the same threefold division; and the means which we adopted of obtaining information were the following:—

We examined *vivâ voce* the late Chief Engineer, the Secretary to the Board of Revenue in the Public Works Department, and the Master of the Survey School; the Superintendent of Roads, his assistant in charge of the high western road, the Superintendent of Government Roads at the Presidency, the Secretary to the Military Board, the Superintending Engineer of the Presidency division and his assistant, as well as some members of his native establishment, and some contractors, the head book-keeper of the Accountant-general's Office, and some other persons. And we examined at great length several Maramut gomastahs from the districts nearest to the Presidency, with the view of obtaining an insight into the actual operation of the existing practice in that branch of the Public Works Department

Department which is under the Collectors. We also addressed papers of questions to the Collectors, the Civil Engineers, the Superintendent of Roads, the Superintending Engineers, and the Commanding Officer of Sappers, and entered into correspondence with individual officers, on particular subjects relating to their districts or divisions. We likewise procured from the Records of the Government Office, the Revenue Board, and other departments, a vast body of papers bearing on the past and present state of the Public Works Department, and its operations in any of its parts.

Plan of this Report.

5. We now proceed to lay before Government the result of our inquiries and deliberations; and as it will be necessary to view the Public Works Department as a whole, we shall, in the first place, detail the present system in all the three branches above specified, pointing out in each those defects which appear to us to exist either in its structure or in its minor arrangements; and we shall then proceed to propose the remedies which we deem suitable to correct those defects and improve the system, giving special attention to the improvement of the establishments, both as to numbers and efficiency.

Although but a very small part of the roads of the country are under the Road Department, yet, for the sake of the more convenient division of the subject, we shall, for the most part, treat of all the roads under the second of the heads above specified.

And we may here add, that agreeably to the arrangement declared in our letter to Government of the 12th May 1852, and approved in Extract Minutes of Consultation, 18th idem, we shall reserve the accounts of the Public Works Department, including estimates, bills, advances and adjustments, and the details of the executive systems, for a Second Report, to be submitted as early as practicable.

Section II.

History and present State of the Maramut Department of the Public Works under the Board of Revenue.

Irrigation very ancient and important.

6. We proceed then to consider the extensive Department of Public Works under the Board of Revenue; and for convenience, we shall designate it by the term "Maramut Department," by which in common speech it is very generally known. With the exception of the districts of Canara and Malabar on the Western Coast, the whole of the territories of the Madras Presidency carry on their cultivation in great part by means of artificial irrigation, the water for this purpose being obtained either by channels taken off from the rivers, or by tanks or reservoirs in which the water of the rains is stored and drawn off for use. Works of both descriptions have existed from very remote times, for the value of irrigation in increasing the fertility of the soil was very early recognized, and princes and rulers of every grade devoted large sums to the formation of such works, which thus, in the course of ages, became extremely numerous. The revenue being so intimately dependent on the efficiency of these works, they received a large share of the attention of the Government, and especially of the Revenue Officers, in whom their immediate custody was vested. Even in the tumultuous and disturbed times which immediately preceded the introduction of British rule in the Carnatic, this duty was not wholly omitted, though many fine works were then allowed to go to ruin, and all were much neglected.

In the early periods of British rule, the department was unorganized and imperfect.

7. The early English Collectors necessarily assumed the charge of the works of irrigation with that of collecting the revenue. It was essential to the security of the revenue that the works should be kept in repair, and large sums were in fact expended on that account; but being without any professional assistance whatever, the Collectors were compelled to entrust the expenditure to native revenue officers utterly without science, and with very little empirical knowledge or practical experience or aptitude for the work, and with other duties to attend to: the consequence was ignorant waste, and fraudulent embezzlement of the public money. In the course of time this state of things attracted attention, and Engineer Officers were appointed under the title of Superintendents of Tank Repairs, to aid the Collectors in this branch of their duty; but for many years they were too few to produce much effect. There was at first only one Superintendent, when our possessions in this part of India were much less extensive then than they afterwards became,

became, and a second was added* in 1809, the principal irrigated districts being divided between the two; but the subject having attracted the special notice of the Honourable Court,† the department was re-organized in 1819, the territories, exclusive of Canara‡ and Malabar being then formed into three divisions, each with a "Civil Engineer;" and the whole being placed under the control of an engineer officer at the Presidency, styled the "Inspector-General§ of Civil Estimates," who was to be the channel of communication in this department between the revenue and engineer officers in the provinces and the Board of Revenue. In 1825 the whole Maramut Department, including the Inspector-general himself, was placed under the Board of Revenue; the Inspector-general having the power, however, to record his sentiments for the information of Government, when they differed from the opinion of the Board.

Improvement of its organization.

8. The department continued on this footing for a number of years: in 1836 a change‖ was made, by giving the Chief Engineer a seat at the Board of Revenue in the Public Works Department, abolishing the office of Inspector-general of Civil Estimates, and creating that of Secretary to the Board of Revenue in the Department of Public Works, upon whom were to devolve all the administrative duties previously performed by the Inspector-general. The object of this change was to give the Chief Engineer a more entire control than he before could exercise over the officers of the corps, and to give the Maramut Department the advantage of his experience.

Further improvement.

9. But in 1838 a still more material alteration was made. The importance of this department to the revenue, and the improvement of the country, had been increasingly felt; and as the necessity of strengthening it as much as possible gradually forced itself on the authorities, the number of officers in the provinces had been increased as opportunity allowed, by withdrawing assistants from the superintending engineers and giving them to the Civil Engineers. Still the want of officers, and the vast extent of the divisions were such, that the superintendence, by the Civil Engineers' Department, was no more than nominal in the great majority of cases; and to remedy this evil as far as practicable, the appointment of Superintending or Military Engineer was abolished in 1838 in four¶ out of the five divisions of the army within the frontier, and the whole Presidency was re-arranged to form eight Maramut divisions, each under a civil engineer. At the same time the duty of constructing and repairing civil buildings in the provinces, which had hitherto been under the Superintending Engineer and Military Board, was transferred to the Civil Engineers and Collectors under the Revenue Board, while the custody of the military buildings (previously vested in the Superintending Engineer) was transferred to the station staff officers, with very small executive establishments; and it was provided, that when repairs or other works to military buildings in their divisions was required, the civil engineers should give their assistance, as far as the other calls upon them would admit. On this footing the department has remained to the present time, with a few minor changes; the arrangement of the divisions has been altered, and the number of officers has been somewhat increased.

Sketch of the system of irrigation.

10. The foregoing is an outline of the origin and growth of the Public Works Department of the Board of Revenue, and of the Civil Engineer's Department in the Provinces; we will now briefly detail the duties of both, and this will involve a short account of the system of irrigation.

Territorial division of this Presidency.

Excluding the small district of Madras, the British territories under this Presidency are divided into 20 districts or collectorates, reckoning as one the newly-acquired principality of Kurnool; and the aggregate extent of the whole is 138,249 square miles. Three districts to the north, viz. Ganjam, Vizagapatam, and Masulipatam, are in great part under zemindary settlement; and the officers of Government

* Colonel D'Havilland to Board of Revenue, 10th September 1818.

† Despatch Revenue Department, 3d Sept. 1817, paras. 13 and 14.

‡ In Malabar and Canara the Superintending or Military Engineer was to perform the civil duties also.

§ Board of Revenue to Government, 4th November 1819. Government to Board, 29th November 1819. The office of Inspector-general was not then first constituted; but its duties became more extensive, because the local Superintendents were increased in number.

‖ Extract Minutes of Consultation, Revenue Department, 31st August 1836, No. 1,158.

¶ In the other division (Malabar and Canara) the appointment of Superintending Engineer had been already abolished, and his duties given to a civil engineer.

ment have but little to do with the internal economy of the zemindaries.* The other districts, which are for the most part under Ryotwar settlement, are each distributed into a number of sub-divisions called Talooks; and each talook is under a Tahsildar, who is its chief revenue officer, and the head of its police, and is also charged, under the general direction and control of the Collector, with the custody of public works, other than judicial and military buildings, within his talook, and with the execution of repairs to such public works. The number of talooks in a district ranges from eight in Trichinopoly to 18 in Malabar; the average number is 13, there being 256 talooks to 20 districts.

Its distribution for Maramut purposes.

Collectorates.		Civil Engineer Divisions.	
Names.	Extent in Square Miles.	Names.	Extent in Square Miles.
Ganjam	6,400	Sub-division	14,050
Vizagapatam	7,650		
Rajahmundry	6,050	1st Division	16,010
Masulipatam	5,000		
Guntoor	4,960		
Nellore	7,930	2d Division	20,900
Cuddapah	12,970		
Bellary	13,056	3d Division	24,019
Canara	7,720		
Kurnool	3,243		
Chingleput	3,020	4th Division	9,820
North Arcot	6,800		
Salem	8,200	5th Division	15,810
South Arcot	7,610		
Tanjore	3,900	6th Division	6,900
Trichinopoly	3,000		
Malabar	6,060	7th Division	14,340
Coimbatore	8,280		
Madura	10,700	8th Division	16,400
Tinnevelly	5,700		

11. These 20 Collectorates are divided nominally into eight Maramut divisions, but really into nine, as will be explained below. The area of each division, and the names of the Collectorates included in it, are shown in the margin. The arrangement of the divisions was re-cast in 1847; and under the present distribution, each division, except the 1st and 3d, contains two districts, one on the coast and one inland. The 1st division comprises five districts, of which all are on the coast except one (Guntoor), and even that touches it at one point; the third division, besides Canara and Bellary, includes Kurnool, where however there is at present but little work going on.

Reasons for the existing distribution.

The objects intended and effected by this re-distribution were as follows: to make all the divisions more compact; to avoid the inconvenience of having one division in which all operations must be at a stand for four or five months, as was the case when Canara and Malabar formed a division; to place the whole course of every river, as far as practicable, under one control; to equalize, as far as can be done, the amount of work in all the divisions; and to secure a due portion of attention to the two northern districts, Ganjam and Vizagapatam. This last object was effected by constituting those districts a sub-division of the new 1st division, and appointing to them a First Assistant Civil Engineer, who is independent of his nominal superior, corresponds directly with the Board, and is in fact a civil engineer in every thing except the name and the salary. The arrangement has been in all respects an improvement.

The districts having Government works of irrigation.

12. Of the 20 districts, Malabar and Canara have no irrigation, for they receive the whole brunt of the south-west monsoon, which fully supplies them with water. The irrigation works of the three zemindary districts are numerous, but only a small proportion of them, viz. those in the Government talooks, are under the charge of the officers of Government. The greater part of the works in Guntoor and Rajahmundry were likewise under the zemindars till lately, but the whole of those in Guntoor, and a great part of those in Rajahmundry, are now under the Collector, and a good deal has been done in the last few years to improve them. The remaining 12 districts are almost wholly Ryotwar, and the irrigation works in them are the property of Government. The following are the principal modes of irrigation in use.

The several modes of irrigation.

The drainage of the whole peninsula of India, except the narrow strip at the foot of the western ghauts, is towards the east; and the larger rivers having a considerable part of their course within the countries of the south-west monsoon, and partaking also of the north-east monsoon, are never quite dry, or only for one or two months in the year. Irrigation is obtained from these rivers either from the high floods, which occur during the height of each monsoon, or from the low freshes, which run for eight or ten months in the year.

By the low freshes of the rivers.

13. The latter are thus turned to account; channels are taken off from the rivers at

* Till recently Rajahmundry and Guntoor were also under zemindars, but many of the zemindars having fallen irrecoverably into arrears and embarrassments, the whole of Guntoor, and a considerable portion of Rajahmundry, have reverted or been surrendered to Government.

at so low a level as to give a command of the stream; sometimes there is an anicut or dam of rough stone or masonry across the river at the head of the channel, which raises the stream at once, and so saves the cost of a proportionate length of channel in bringing the water to the surface of the ground; generally, when there is no permanent anicut, a temporary dam has to be made annually. These channels require a regulating sluice at the head, to prevent the influx of the water of the high floods; some however are without such necessary works, and are frequently breached or filled with sand by the high floods. The channels being led off at a less incline than the bed of the river, are so brought to the surface of the country, and then flow along between embankments, the water being let out to the lands by means of small sluices in the banks. Most of the irrigation from the Cauvery, the Umrauvutty, the Noel, the Tambrapoorny, the Vigay, the Pennar, and the Toombuddra, is of this description; and of this kind also will be the irrigation from the new anicuts across the Godavery and the Kistnah. Some of the most valuable works in the country are channels of this kind; there are single channels from the Cauvery flowing a course of 30 miles, irrigating the lands of above a hundred villages, and producing an annual revenue of above a lack and a half of rupees.

By the high freshes.

14. Flood-water channels are taken off from the rivers by similar means to those just spoken of, though sometimes at a somewhat greater height above the bed of the river; they are led on a high level like the others till they come to the surface of the country, and their contents are there received into extensive tanks or reservoirs, where the water is stored for use, and drawn off to the fields as required, by means of sluices in the bund or retaining bank of the tank. These channels also are not secure unless they have regulating head sluices, but many are without them. These, too, are sometimes supplied by means of an anicut, and sometimes not; the same anicut sometimes supplies channels of both kinds, and the same channels sometimes irrigates in both methods, conveying the water of the high floods to a tank, and distributing that of low freshes to the lands situated along its course. It will be obvious, from this brief description, that the operation of a flood-water channel need not interfere with the rights of existing low fresh channels. It is only necessary that the floor of the former shall be raised sufficiently above the bed of the river; and the flood-water channel will then only take that portion of the stream which is not required by the other. There are some fine tanks supplied by means of such channels; such are the Veeraunum tank in South Arcot, the Cauveripauk and Maumundoor tanks in North Arcot, the Cumbum tank in Cuddapah, and many others; but in general it may be affirmed, that the greater part of the flood waters of our rivers are turned to no account, and vast bodies of water flow annually to the sea, which might be made use of to fertilize hundreds of thousands of acres now jungle or waste, to feed and maintain a vast population, and to add enormously both to the wealth of the people and to the revenue of the Government.*

Irrigation tanks described.

15. Some account must be given also of the "Tanks" just spoken of. A tank is not an excavation, as might be inferred from the term; it is a receptacle for water, formed by constructing an embankment or bund across a valley, and so damming up the drainage of the valley. The bund is of earth, but it is often protected in front with a facing or revetment of rough loose stone, as a defence against the action of the waves raised by the wind on the surface of the water; it is also pierced by sluices or tunnels of masonry, by which the water is drawn off as required to the fields below, and which are furnished with a simple contrivance for opening and closing them. Some of these bunds are of great size. We subjoin a memorandum, showing some particulars of four of the largest, though not absolutely the largest:

District.	Name of the Tank.	Height of the Bund.	Length of the Bund.	Number of Villages watered.	Average Annual Revenue to Government.
		Feet.	*Miles.*		*Rupees.*
Nellore - -	Cunnigherry Tank - -	20	2	23	78,000
North Arcot -	Cauveripaukum Tank -	45	4	23	43,000
Chingleput -	Chumbrumbaukum Tank	25	3½	58	49,000
South Arcot -	Veeranum Tank - -	21	9	149	1,14,500

But

* As canals for irrigation have been found to be prejudicial to the public health in Northern India, we may here state that such result has never been met with in this Presidency.

But there are few tanks of this large size; the greater number yield under *Rs.* 5,000 annually each, and from many the revenue is under *Rs.* 1,000, or even *Rs.* 500. Many tanks, and all those of magnitude, besides collecting the drainage of the country in their front, receive water also from rivers, by means of channels, as already described. And this is by no means confined to tanks of the largest size; hundreds of tanks yielding no more than *Rs.* 3,000 annually have river channels. This is indeed by far the most valuable source of supply, as being more secure both from deficiency and from excess than a dependence on the rains of the locality.

Calingalahs.

Tanks possessed of only this latter source of supply form, however, a very numerous class, from small tanks having bunds 500 yards long, and yielding *Rs.* 300 or *Rs.* 400 revenue (many indeed are smaller than this), to such as have a bund of a mile in length, and yield *Rs.* 3,000 or *Rs.* 4,000 in a good year. Many of these works might be supplied from rivers, and their value would be much increased by such improvement. It is only necessary to add, that to obviate the danger of an excessive influx of water, most tanks are provided with an outlet called a Calingalah. This is work generally of masonry in large tanks, in others often of rough stone; it is built in the bund, near one end of it; it is so much lower than the bund itself that any superabundant water can escape over it, and of such width or gorge as to be sufficient to carry off all such surplus water. This opening is closed towards the end of the rainy season, so as to keep the tank quite full; and this is done by means of straw and turf. To aid this operation, the crown of the calingalah is generally provided with a row of rough granite posts, about three or four feet high, as an assistance and support to the wall of straw, turf, &c. which is built up in front of them.

Statistics of irrigation works.

16. In concluding this cursory view of the system of irrigation in use in this Presidency, we would give a statement of the number of works of each description, and of the various sizes, but no such classified list exist, and could only be prepared with much time and labour in the districts. In 1845 the Board of Revenue called upon the Collectors and civil engineers to prepare and submit lists of the tanks and channels, &c., yielding above *Rs.* 500 of annual revenue, with certain particulars. When completed the statements will form a useful record; as yet they are extremely imperfect, the civil engineer having had no time to revise them on the spot, as is properly required by the Board. The mere mention of the number of the works would give no just idea respecting them, as they vary so greatly in size and value; but we may notice that, according to the Jummabundy returns received by the Board of Revenue, which however cannot be relied on for accuracy, the number of tanks and channels in 14 of the chief ryotwar irrigated districts (omitting Tanjore, from which accounts are not received, but including Kurnool), considerably exceeds 43,000 in repair, besides above 10,000 out of repair. To these belong innumerable sluices, calingalahs, anicuts, head sluices, and a variety of other works, large and small. The revenue immediately dependent on the Government works of irrigation is about 135 lacs of rupees, besides fully 15 lacs more, alienated as enam; and assuming that they now yield no more than 10 per cent. on their original cost, the amount of the capital invested in their construction may be taken at 1,500 lacs, or 15,000,000*l.* sterling. The amount actually expended was probably much more, for many of the old works were constructed on very unfavourable sites, and many others were formed less with a view to profit than as perpetual memorials in honour of the founder, and at a cost very disproportionate to the probable return.

The custody of the works of irrigation.

17. The custody of this vast amount of property, on which so large a part of the revenue depends, and which from its very nature is peculiarly exposed to much ordinary wear and tear, besides many occasional risks, devolves primarily on the Collector and his tahsildars; then on the Civil Engineer Department, whose more special province it is to give advice and assistance to the Collector, in preventing danger and repairing damage; and, lastly, on the Board of Revenue, as supreme controlling authority over both the lower departments.

Of the roads and other communications.

18. The roads and communications of the country are also generally under the Board of Revenue; and, subject to its control, are under charge of the Collectors and Civil Engineers. Up to a recent period, all roads throughout the Presidency were under the Board, except those at Madras and those within military cantonments; but in the early part of 1845, a new department was constituted, under a Superintendent of Roads, to whose charge are entrusted certain of the principal lines, extending in the aggregate to about 2,300 miles. All other roads in the provinces,

provinces, as well as the few navigable canals that exist, are still under the Board of Revenue. The extent of these roads cannot be stated, for they have never been classified or measured; but some idea of it may be gathered from the consideration that they form the internal communication of a country considerably larger than the whole of the United Kingdom. We shall have to speak of the condition of the roads below; and will here only observe, that they have almost invariably been wholly neglected. This circumstance is to be attributed in part to the fact that the Civil Engineers have never had more than a very little time to give to the roads, while without their aid the Collectors could do very little; but chiefly to the fact, that the importance of improving the communications has never been duly recognised. Hence the Board of Revenue have failed to do more than adopt some of the improvements brought before them by the local officers, and have never attempted to form any general system of roads; and hence, expenditure on the roads has almost always been an unwelcome subject with Government, and they have discouraged the submission of projects of improvement by the Board of Revenue, and have rejected some that have been submitted.

And of the Government buildings.

19. All revenue, judicial and general buildings in the provinces are likewise under the same authorities, except that the custody of judicial buildings rests in the Judicial Department and not in the Collectors, and estimates for their repair or improvement, though made by the Civil Engineer or the Revenue Officers, and executed by the latter, are submitted for the sanction of Government through the Sudder Adawlut, and not through the Board of Revenue.

The revenue and police buildings comprise the Collectors' Cutcherries, the Treasuries, the Talook Cutcherries, Sea Custom-houses, Salt, Godowns, Cutcherries of Police Ameens and the Cutwals' Choultries. The judicial buildings comprise the Court-houses of the Civil and Subordinate Judges, and of the Principal Sudder Ameens, Sudder Ameens, and the District Moonsiffs, and the Gaols. The general buildings are chiefly Dispensaries, Travellers' Bungalows and Lighthouses.

Duties of the Board of Revenue in connexion with those works.

20. In all the foregoing classes of works, judicial buildings excepted, all repairs and alterations are made under the orders of the Board of Revenue; and it is the same authority that receives and discusses all projects for constructing new works, or for improving or enlarging old ones. All estimates for such works are submitted to the Board by the local officers, except in the few cases to be noticed below, in which such submission is dispensed with; and if approved by the Board, are laid by them before Government. The Board likewise exercises control over the execution of works; receives, examines and submits to Government the bills for work done; distributes and transfers the assistants and other subordinate officers of the Civil Engineer; is the referee and appellant authority in all matters connected with the Maramut Department; and, in short, exercises a general control over every part of the department, whether under the Civil Engineers or under the Collectors. It is obvious that these duties must involve a vast deal of business. The number of estimates received and disposed of by the Board, in 1850, was 5,872, to the amount of *Rs.* 17,28,324; and the number of Bills passed and submitted to Government in the same year, was 8,530, to an aggregate amount of *Rs.* 11,86,284; the number of letters received and despatched from and to Government, was 945, and from and to other offices, was 6,743; the number of foolscap pages of current business, was 22,332. And even with this amount of work the Board's office is not kept clear, and in one important particular there are heavy arrears. We find, that from the heavy pressure of business in the office, bills for works done can rarely be examined in less than a year after receipt, and, probably, in consequence of this inability to deal with them when they come, the Board fail to hasten their submission by the district authorities; so that a still longer time sometimes elapses between the completion of a work and the transmission of the bill for it to the Board. To this subject we shall have to recur in more detail in our report on the accounts of the department.

Such delays, however, can hardly be imputed as a fault of the Board, they proceed almost wholly from the inadequacy of their office establishment; and for that the Board are not responsible, as they have repeatedly, though with very scanty success, urged on Government the necessity of giving them more assistance in their office.

The working of the Board.

21. The Board, in common with the provincial part of the department, have also been charged with other misfeasances; viz. over-expenditure beyond estimates,

the failure of works, and the recommendation of projects without sufficient examination. But it appears that an appeal to actual facts fails to substantiate these charges. With respect to insufficient estimates, we obtained from the office of the Board a statement showing the amounts of all the estimates for occasional works in the six years, 1843 to 1848, being 150 in number, and the sums actually expended in the execution of each. Out of the whole number of estimates, to the total amount of *Rs.* 11,60,184, we find that only 16, to the aggregate amount of *Rs.* 2,31,249, were exceeded in execution by more than 10 per cent. And of this small number, the excess was caused, in five instances, by natural accidents, such as certainly no estimate ought to provide for; in three, by the enlargement of the design after the estimate was sanctioned; in two, by unforeseen rise in the price of timber; and in others by various causes, of which want of good superintendence, and defective arrangements on the part of the revenue officers, seem the principal. In four, the sole or the partial cause seems to have been an inadequate estimate; but in two out of the four, a nearer approach to the fact could not have been obtained beforehand, except by a careful examination of the soil over long distances, and at very considerable depths; an operation involving both loss of time and expense. The statement here alluded to is a long one, and as this is the only occasion on which we have to advert to it, it seems needless to print it in the Appendix.

As to the alleged adoption and recommendation of projects by the Board on insufficient grounds, and the unsuccessful issue of such projects, we beg to refer to the statement in Appendix (Z.) That statement shows the results of all the expenditure for improving irrigation during 14 years. The number of works is 39, and their cost *Rs.* 5,41,116; and the annual return in revenue, after deducting the cost of repairs and minor improvements, amounts to 69 ½ per cent. on the outlay, a result which must be admitted to be a full justification of the recommendation of the projects by the local officers and by the Board of Revenue. Three of the works, from peculiar causes, have yielded no profit, and that afforded by others has been at a low rate; but it is not in the nature of things that all should be equally successful; and excessive caution to avoid all possibility of failure might have refused some of the projects which have proved the most remunerative. We shall have to advert to this statement again.

Its defects.

22. But though we are of opinion that the Board have to this extent acquitted themselves of the duties committed to them, we are of opinion that they have much come short of what ought to have been done in more important parts of their duty, viz. in the higher functions of a general controlling authority. We find an absence of anything like a general view of the resources and of the wants of the different parts of the country. With one imperfect exception, there has been no attempt to ascertain the number, size or condition of the works of irrigation throughout the country; there seems to have been no comparison of one district with another, either as to the quantity of work done, the cost of doing it, or its results; no inquiries as to the capabilities of districts for improvement, or as to the backwardness of some officers to bring forward improvements, compared with the multiplicity of such recommendations received from others. And as to the roads, there has been no comprehensive view of the wants of each district, no general scheme of roads proposed, no consideration of the sort of road or other means of communication most proper in each locality. In short, the Board have done their best, with the aid, in general, of a highly efficient Secretary, but with a very inadequate office establishment, to deal with the business brought before them; but they have attempted very little beyond that, and have rarely taken the initiative in suggesting improvements.

The cause of those defects.

23. And the cause of these deficiencies is not difficult to discover, it lies undoubtedly in the fact, that the Board is physically utterly unequal to the various duties required of it. It is primarily a Board of Revenue, and its duties, in connexion with the public works of the country, highly important as they are, have always and unavoidably been regarded as supplementary and subordinate. The revenue duties are fully sufficient to occupy the whole time of the members, and they are unable to give more than a very limited amount of attention to the Public Works Department. It is true that the Chief Engineer has a seat in the Board in that branch of its business, and nominally he is the professional head of the department; but he has, besides that, two other offices to attend to, his own and the Military Board, in which also he has a seat. Hence he also, though he gives his written opinion on new projects, agreeably to the orders of the Honourable Court,

Court, has but little time to give to the general business of the Board or to devote to the improvement of the department. Again, except on the one day of the week that the Revenue Board meet, he does not come to that office, but sits in his own office, in a distant part of the Fort. Hence, when the authority of a member of the Board is required for any order, the Secretary is naturally led to apply to one of the civil members instead of the Chief Engineer; and thus, though all papers go in circulation to the latter officer, yet many minor matters, which require immediate reply, are disposed of before he sees them; and from these causes it comes to pass, that he certainly exercises less influence in the department than might be expected from his ostensible position. In point of fact, the Secretary alone has long been its real head; and this is more emphatically the case in consequence of a late despatch from the Court of Directors.

Up to a recent period the Secretary regarded himself, and was regarded by the Board, simply as their ministerial officer, bound to afford them the aid of his knowledge and experience, but not sharing the responsibility of their decisions. But in their despatch of the 29th May 1845, para. 11, noticing the insufficiency of the estimate for the Godavery anicut, the Honourable Court passed censure jointly on the Chief Engineer and the Board's Secretary in the Public Works Department, for not having pointed out the inadequacy of that estimate. Captain Bell now felt that if he was to be liable to censure for acts of the Board, it was just that he should have the right to record his dissent from their opinions; and this right the Board conceded to him, and he has exercised it more than once. This state of matters appears to us very objectionable; it is obviously contrary to good policy that a Board should be so weak or so encumbered as to be obliged to leave the disposal of business wholly to the Secretary, but we think it still worse that a Secretary, whose duty it is to carry into effect the orders of the Board, should be placed in the mixed and anomalous position of also sharing their responsibility, and therefore of discussing and disputing their orders.

Vast and progressive increase in the business of the department.

24. The defects now noticeable in the present constitution of this department must have existed in some degree from the very first, viz., when a department for Public Works was constituted in the Board's office in 1836, and we cannot suppose that that arrangement was adopted as anything better than the least of two evils. And not only has the business of the Revenue Department of the Board very much increased since that time, but the Maramut, or Public Works Department, has become enlarged in a much greater degree. At the time of the change that department was still infantine in its proportions, and utterly crude and unformed in its structure, but during the whole succeeding period it has been gradually and progressively growing, till at the present time, though still much below the requirements of this extensive country, it has far outgrown the power of the present controlling body to deal with it. To prove this we need only appeal to a table which we have obtained from the Board, and which we give in a note at the foot of this page.* It will be seen from that Table, that since the department was annexed to the Board of

* Table of the Increase of Business in the Office of the Board of Revenue in the Public Works Department.

Years.	Correspondence.				Foolscap Sides of Collections for Honourable Court.	Foolscap Sides of Current Business.	Expenditure.			Number of European Officers, and Revenue Surveyors in the Department.
	With Government.		With other Officers.				Works of Irrigation.	Buildings and Roads.	Total.	
	Received.	Sent.	Received.	Sent.						
							Rs.	*Rs.*	*Rs.*	
1836	229	203	672	707	649	4,174	6,97,951	45,723	7,43,674	26
1837	350	247	920	958	765	6,270	5,30,832	1,18,525	6,49,357	24
1838	429	386	1,371	1,281	1,094	7,695	5,96,668	1,97,762	7,94,430	29
1839	327	245	1,083	1,090	1,674	6,582	5,14,818	5,02,951	10,17,769	25
1840	319	281	1,410	1,111	1,839	6,758	6,25,013	3,90,446	10,15,459	31
1841	249	225	1,317	958	1,986	6,977	5,69,937	3,65,684	9,35,621	33
1842	298	224	1,228	950	2,518	6,895	5,30,845	4,11,217	9,42,062	36
1843	241	224	1,534	932	2,490	7,193	3,98,016	4,47,621	8,45,637	34
1844	337	324	1,655	917	2,718	11,152	6,09,687	3,74,577	9,84,264	34
1845	376	353	1,904	950	4,874	10,345	5,89,631	2,31,907	8,21,538	36
1846	436	393	2,580	1,279	6,537	10,246	5,65,186	2,13,802	7,78,988	40
1847	442	409	3,112	1,476	5,715	10,143	7,53,630	2,75,639	10,29,269	58
1848	479	514	3,482	1,369	5,850	13,976	9,03,088	4,14,104	13,17,192	73
1849	452	444	3,677	1,501	4,084	19,860	6,29,542	4,00,522	10,30,064	78
1850	449	496	4,156	1,642	2,890	22,332	9,54,441	2,56,419	12,10,860	87

of Revenue, the correspondence with Government has increased nearly sixfold, and the whole correspondence nearly ninefold; that the expenditure under the control of the Board has very nearly doubled, and that the number of commissioned and non-commissioned officers and revenue surveyors has increased from 26 to 87, or nearly fourfold.

And it must and will increase still more.

25. And it is important to observe how singularly equable and continuous the increase has been in every particular; showing conclusively that it has not been owing to any extraneous or accidental circumstances, but has been the natural process of the growth and development of a new department, and it is certain that this department is still very far from having reached its full dimensions. We shall have to detail, in a subsequent part of our Report, how unequal the existing establishments are, even to the present scale of operations, and how urgently the interests of the Government, and of the country, require that those operations should be much enlarged. We are led, therefore, to the inevitable conclusion, that the Board of Revenue is of necessity, and from the very nature of the case, unequal to the control of the Maramut Department; we consider it absolutely necessary that this duty should be transferred to a different body, and in the proper place we shall set forth what we consider the fittest and best plan to adopt.

The Civil Engineers' Department.

26. We have next to detail the system of carrying on work in the Provinces. We have already (paras. 7 to 10) alluded to the gradual development of the Civil Engineer Department; it consisted at first of a single officer, but as our possessions extended, and its importance became better understood, it was enlarged from time to time, till it now numbers 24 commissioned officers of Engineers, besides 11 officers of the Line temporarily employed; there are also 25 Revenue Surveyors, who are, in fact, assistants to the Civil Engineers in their general duties, and 23 European Overseers from the Sappers and Miners, who are employed generally in the superintendence of large works in execution. The department, however, is one of supervision chiefly; the execution of works rests, for the most part, with the Revenue Department. The tahsildars are charged with this duty in their respective talooks; there are also a number of maistries and maramut accountants in each district, and most of the revenue servants take part in the duty in their respective ranges.

Evils of its former weakness.

27. Formerly, when the Civil Engineer Department was in its infancy, the estimates for all repairs of an ordinary character were made by the tahsildars and maistries, but this practice was found productive of very bad effects. The tahsildars were quite ignorant of the principles of the work thus imposed on them, and the maistries were no less so, and hence their estimates were generally injudicious and wasteful. Again, repairs were often allowed by a tahsildar, when they were not at all wanted, for the purpose of throwing Government money into the hands of his own friends or connexions among the village meerasdars; or if a heavy balance was outstanding in a village, a considerable sum was allotted for the repair of its tank, but was immediately credited in liquidation of the arrears; and in addition to these abuses, gross fraud was practised, in the absence of any sufficient supervising department, by charging for work which in fact had never been done. As the Civil Engineer Department became stronger, it became more and more the custom for estimates of all kinds to be made by that department, and the inspection exercised by it over work done has also become very much more extensive than it could be formerly.

Present system.

28. The system, according to the present practice, is as follows: the work is divided into three classes, Emergent, Ordinary, and Occasional. Emergent work is that which cannot be postponed, as when a tank or channel is breached, and must be repaired immediately, to save the crops, and the revenue of the year. Such work is done immediately by the Collector, without applying for sanction; it is for the most part of a very small amount.

The "Ordinary" estimates.

29. All irrigation works are necessarily exposed to the action of water, and of water running or raised into waves. It is obvious, therefore, that they must stand in need of continual attention and repair, especially that large portion of them which are composed of earth. The "Ordinary" estimates meet this necessity; they include, as their name implies, those repairs to tanks and watercourses, and other irrigation works, which are of a merely common and matter-of-course description, and such as are necessary to keep the works in efficient condition. Estimates of this class are now for the most part made by the Civil Engineer or his subordinates, who,

as

as they pass through the districts in their tours, receive lists of works requiring repair from the Collector or tahsildar, or visit them without their being so expressly pointed out. The estimates so made are sent to the Collector, who after examining them with reference to the revenue of the village and other particulars, enters them (or such of them as seem proper to be executed), in an annual list. A similar list is made of those ordinary estimates framed by the tahsildars, which have been approved by the Collector, and both these lists are sent to the Civil Engineer. It was the practice, till very recently, to send these lists to the Board of Revenue, by whom they were submitted to Government; but this practice has lately been discontinued as quite useless, since the works were, for the most part, executed before the pleasure of the Government or the Board, as to the estimates, could be known to the Collector.

Their execution.

30. As soon as the lists are made out by the Collector, or as soon after the commencement of the year as possible, the Collector issues his orders to the tahsildars to commence the work, placing at their disposal for the purpose a sum equal to about a half or one-third of the amount of the estimates for their talooks respectively. The tahsildars then take steps for the execution of the work, making engagements with workmen, and making advances to them; and this is done in all ordinary works of moderate amount by means of the village officers of the villages where the work is to be done. When the first advance is worked out a second is made, and so on till the work is completed. The work is marked out and explained by the talook maistry, who also visits it from time to time while in progress, and reports on it. It is also, in many cases, visited while in progress by some officer of the Civil Engineer Department; and monthly or bi-weekly progress reports of the work are also sent to the Collector by the tahsildar. When completed, the work is measured, first by the Tahsildar's Department and by the maistry, and afterwards, in many cases, by the Civil Engineer Department, and the accounts are then made up.

The "Occasional" estimates.

31. The estimates called "Occasional" are in general terms, such as are designed either for the improvement or extension of existing works, or for the construction of new works. Of late years, indeed, some sorts of work have been required to be included in the occasional list which are merely "Ordinary" in their character. The intention of this change appears to have been to limit the discretion of the local authorities, and we think the effect has not been beneficial. Occasional estimates are made almost wholly by the Civil Engineer Department, though often on suggestion or recommendation from the Collector. They require the previous sanction of Government before execution, and are submitted through the Board of Revenue. When the estimates are sanctioned, they are executed by the tahsildars in the same manner as "Ordinary" estimates, except that the larger or more important works are now often executed under the superintendence of European overseers: in that case also the materials are frequently provided by the tahsildars. It may be here observed, that the Assistant Civil Engineers and also the Surveyors are generally authorized to make estimates or suggest projects. The Surveyors, however, generally refrain from making estimates for large works, except when they have been specially deputed on that duty, contenting themselves with bringing the subject to the notice of the Civil Engineer for his orders. In all cases the Civil Engineer adopts only such projects or estimates of his subordinates as he approves, disallowing the rest, or detaining them till he can obtain further information on the subject, by personal inspection or otherwise.

Estimates for roads, bridges and buildings.

32. Estimates for repairing or making roads and bridges (other than the trunk roads), and for the repair or extension or construction of revenue and judicial buildings are under similar rules to those for occasional works of irrigation, except that in the case of judicial buildings, the estimates, after having been framed by the Civil Engineer Department (or if small by a maistry of the Collector's establishment), is submitted to Government for sanction through the Civil Judge and Sudder Adawlut, instead of through the Collector and the Board of Revenue. The estimates for all these works are almost invariably made by the Civil Engineer Department, except in the case of very trifling repairs. The previous sanction of Government is, in all cases, necessary before execution (except in the trifling cases of emergent repairs under *Rs.* 20 to buildings generally, and under *Rs.* 50 to travellers' bungalows), and when sanctioned, the work is done, in most cases, by the Tahsildar's Department, aided, when necessary, by the instructions of the Civil Engineer; and in the case of larger works, it is often done under the superintendence of a European overseer.

 33. It

Inspection by the Civil Engineer.

33. It will be seen from the above brief detail of the present system, that the executive is almost entirely in the hands of the tahsildars, under the control of the Collectors, while the duties of the Civil Engineer Department are first, projecting and estimating; and, secondly, directing and inspecting. The works indeed are so numerous and so scattered, that with the utmost activity a Civil Engineer is unable to provide for the inspection of all by himself or his department; but all are liable to inspection, and it cannot be said beforehand which works will actually receive it, and which will not. The inspection too is a real effectual inspection, the work done is measured, and its quality tested, the accounts are examined, and the charges compared with the rates paid at other places, and with the common rates of the spot, and the complaints of the workpeople, if any, are received. A report of the whole goes to the Collector, who calls the parties concerned to account, as may be required by the circumstances; and a copy of the Civil Engineer's diary, with a memorandum of the Collector's orders upon it, goes to the Board of Revenue. Again, as to works in progress, not only are a considerable number visited by the Civil Engineer Department, but the Collector, the tahsildars, and the maistries correspond with him when at a loss on any point connected with the works, and receive his instructions.

The engineer officers are too few.

34. With respect to the Civil Engineers' branch of the department, we have no hesitation in saying that its first and chief want is an increase of Engineer Officers. On this point, however, we will not enlarge here, as we shall have occasion to discuss it at length hereafter, we will only remark that a very little consideration is sufficient to show that the present strength of the department must be inadequate to its duties. The average extent of a division (*see* para. 11) is little less than 16,000 square miles. Over this large extent are scattered, probably, 10,000 works of irrigation, all of which require, in a greater or less degree, the attention of the Civil Engineer. The number of works actually receiving repair or improvement in a division may be about 800 annually, almost all of which ought to be estimated for and examined by the Civil Engineer's Department.

Consequent evils.

35. But besides this ordinary and routine work, many openings for improvement call for the attention of the Civil Engineer, which would be valuable in increasing the revenue and developing the resources of the country, but for which he has little time; these are both the restoration of many ancient works which were destroyed many years ago, and have never been restored, because no officer has had leisure to attend to them; the improving and enlarging of existing works, and the formation of new works. It is indubitable that much remains to be done in every district in this direction, in particular in turning to more advantage the waters of the numerous rivers which traverse the Carnatic. But to this end it is absolutely necessary that there should be officers in each division possessed of sufficient time to attend to such projects. The neglect of extending irrigation from the great rivers is noticed by the Board of Revenue in their letter of the 15th February 1847, Para. 28 to 31, Appendix (G.), the Board recommend that four officers should be specially employed for investigating projects of that description.

The roads.

36. Again, there are the roads, the improvement of which is of the utmost importance as respects both the Government revenue and the prosperity of the people. The district roads (*i. e.* all roads except the trunk roads), have always been nominally under the Civil Engineers; but as we have already said, very little has been done to them. If the country is to make any advance, this neglect must no longer be suffered; and we also propose, as will hereafter be more fully detailed, to place the local charge of the trunk roads also under the Civil Engineer. This subject, however, will be treated of more at large below, we now only refer to it as affording one reason why the Civil Engineer's department must be strengthened.

The public buildings.

And in addition to all the foregoing, the Civil Engineer has to provide for the repair, improvement and construction of the numerous civil buildings in two Collectorates, which, in 1850, averaged 40 distinct works, at an outlay of *Rs.* 16,000 in each division; and it is also necessary, as remarked by the Board, that the Civil Engineer should be enabled to give more attention to the military works in his division than has yet been practicable. This also will be more fully noticed in another place.

The department must be strengthened.

Looking to all these calls on a Civil Engineer's time and thoughts, and even allowing for the additional strength which we shall propose to the subordinate departments, we are decidedly of opinion that, in order to secure efficiency, a considerable

siderable addition must be made to the permanent establishment of Engineer Officers in the Maramut Department, independently of those which will be at all times required for special works. We shall state below the details of what we think necessary, with particular reference to the order of Government,* calling for our opinion as to the number of Assistant Civil Engineers to be appointed to the department.

The Subordinates of the Civil Engineer Department.

The Revenue Surveyors.

37. We will now briefly notice the Subordinates of the Civil Engineer's Department, and the particulars in which their efficiency needs to be increased. These subordinates are of two classes, the Revenue Surveyors and the Overseers. The former class appear always to have existed in the department; they have invariably been East Indians with one exception, that of a Serjeant of Sappers, who was made an assistant Revenue Surveyor some years ago. The term Revenue Surveyor may lead to the impression that these officers have some connexion with a Revenue survey; but this is not the case, there is no establishment whatever for such surveys; nor has a correct survey been made of any portion of the Madras territories. This class appear to have been called Surveyors, because surveying is a principal part of the instruction they receive; and Revenue Surveyors, because they are chiefly employed on irrigation works on which the revenue so much depends. Even in the latter sense, however, the term surveyor is improper, as their duties are by no means limited to surveying; they are in fact employed by the Civil Engineer as far as their respective individual qualifications enable him to do so, in all the various duties appertaining to the department; besides surveying and taking levels, they project small works, make estimates, and inspect work performed by the Collector's Department, and they are also occasionally employed in the superintendence of important works in execution. A Survey School, previously attached to the Observatory, was transferred in 1819, to the office of the Inspector-general, for the instruction of lads designed for Revenue Surveyors, and is still in existence; it is on a very meagre scale and a very defective plan, and in a subsequent part of this Report we shall have to recommend its abolition. On leaving the school, which they do after a course of about a year or a year and a half, and after an easy examination on the subjects which they have there studied, the lads are placed under the Civil Engineers as Sub-assistant Surveyors; their pay is *Rs.* 79. 0. 8., and as soon as they are reported by the Civil Engineer to be qualified for detached duty, they receive *Rs.* 24. 8., tent-allowance in addition. After being seven years in the department, from the time of entering the school, their allowances are raised to *Rs.* 141. 4., on their being recommended for it by the Civil Engineer; and two further advances of salary are open to them after certain terms of service, on the same recommendation. There are now in the department 25 Revenue Surveyors of the several grades.

Their qualifications on first appointment.

38. We were particularly anxious to ascertain the actual qualifications of both the Surveyors and the European Overseers, and the results of their employment, and we addressed a number of questions to the Civil Engineers on the subject. The information we have obtained, as respects the Surveyors, is as follows: when a lad first joins a Civil Engineer's office, being then about 19 years of age, he is generally acquainted with such parts of his duty as can be learnt in an office; he can draw plans pretty well; can survey and take levels, though not with accuracy or certainty; and can prepare estimates, if the dimensions and other details are furnished to him. He is totally wanting in practical knowledge; he does not know a good brick from a bad one; is quite ignorant of the mode of preparing bricks or chunam; knows nothing, except by hearsay, of the various works employed in irrigation; and though he can generally speak one or perhaps two native languages, he cannot read or write any.

Their instruction and improvement afterwards.

39. A Sub-assistant Surveyor is generally kept by the Civil Engineer in his own office for about a year, during which period he is employed in drawing plans, and perhaps calculating estimates; he also accompanies the Civil Engineer in his visits to all works, and has the advantage of hearing his remarks upon them, and his instructions to maistries or others superintending works, and of reading his diaries. In this manner, by intercourse with the Surveyors and Overseers in charge of works visited, or who may come to the Civil Engineer's office, and by being employed

* Extract Minutes of Consultation, Revenue Department, 24th April 1851, No. 396.

employed occasionally to take a set of levels or make a survey, the young man gradually acquires some insight into his duties; and after a year or two, the Civil Engineer is compelled by his need of such aid, to detach him to make estimates for small repairs, and to inspect work done; as he improves, his services become more valuable, and he is gradually employed on more important duties; and those of the number who turn out well, become extremely useful to the Civil Engineer after they have been seven or eight years in the department.

Their defects; conceit.

40. As regards the moral qualities of this class, they are stated to be in general intelligent; they are also represented as having been for the most part both honest and sober; though some exceptions have occurred in both points. Their great defects appear to be, indolence; a want of activity and energy; an over estimate of their own importance; and a false estimation of what constitutes respectability, which makes them regard it as a degradation to put their own hands to any work. When first detached on duty by the Civil Engineer, a Sub-assistant Surveyor is only about 20 years of age; yet he goes about a district, inspects and reports upon work done by men of much greater practical knowledge than himself; his diaries go to the Civil Engineer and to the Collector, and orders are issued upon them, fining a maistry or reprimanding a tahsildar. Of course he feels himself to be a person of importance; he is liable to give himself airs; and though the testimony as to the general integrity of the class is very uniform, yet it must be taken rather with reference to gross acts, and there is no doubt that the temptations have been too strong for not a few young heads to bear.

Indolence and carelessness to improve themselves.

41. Almost all the officers whom we applied to, concur as to the indolence of the Surveyors, and their want of desire to improve themselves; and most of them, and we think with justice, condemn the rules with respect to promotion and salary, as in great part the cause of this apathy. The Sub-assistants appear to display much activity for a short time previous to the period at which they become entitled, in point of service, to promotion; and the same with the Assistant Surveyors, as they approach the periods for the increase in their allowances; but when the desired object is gained, this temporary zeal disappears. We think the principle of the present system a bad one, and we shall recommend a change: where length of service is the rule for pay or promotion, the necessary recommendation will rarely be withheld for mere negative inefficiency; we should have expected the practical operation of the rule to be just what it is stated to be, more especially as the very frequent changes among the commissioned officers of the department encourage a Surveyor to hope that the officer who witnesses his inactivity after gaining a step in allowances, will have left the division long before it becomes necessary that he should obtain a recommendation for another step.

Want of energy and resource.

But it is in the actual superintendence of work that the want of energy and resource in the East Indian Surveyor contrasts so strongly with the qualities displayed by the European Overseer; even in enduring exposure to the climate, that is to heat and wet, the latter is stated by some officers to be superior, his greater physical stamina more than counterbalancing the advantage which the East Indian possesses in being in his native climate.

Proposed remedy.

42. There is one remedy for these defects in the character of this class, which we think will work a reform, and we think it is the only one: it is to throw the appointments open to the Overseers from the Sappers, a most valuable class, and form the whole into one body, every individual to enter in the lowest grade, and to rise less by length of service than by merit. Under such a system as we shall hereafter propose, the East Indian as well as the European will in the first place go through a course of theoretical and practical instruction; they will then be employed in common in executing large works, taking levels and making surveys; and meanwhile they will every day be gaining an addition to their store of knowledge and experience; and when they arrive at such a rank as to be employed independently on the more responsible duty of estimating for repairs or new works, or reporting on works executed, they will not be mere lads, but men of knowledge, experience and steadiness of character.

We think this open competition essential to the efficiency of the department, and we anticipate much benefit from it to the East Indian aspirants themselves. For want of models of other ranks, they have grown up under the idea that they must aim at being gentlemen; but they will now learn that it is no degradation to them to handle a tool, or to show a workman how to lay a brick or use a momaty.

momaty. The indolent and idle will leave the department, or will not seek to enter it; but the active and energetic will be roused to exertion, and many we believe, under this joint stimulus of example and emulation, will compete successfully with their European comrades.

The European Overseers.

43. The employment of European Overseers from the Sappers is only of recent origin. The first suggestion on the subject came from Colonel Cotton, who in 1844 applied for the assistance of some of the most intelligent non-commissioned officers of the Sappers and Miners to aid him in the work of improving the irrigation of the Rajahmundry district, on which he was then engaged. This application, though supported by the Board of Revenue, elicited only a general reply from Government; but in January 1845, the Chief Engineer, Colonel Sim, brought urgently before Government the utter absence in this Presidency of intelligent subordinates, competent to execute large or difficult works; a want which had often come under the notice of the Government before, and which was quite notorious; and he recommended that a European Subordinate Department should be formed here, similar to what already existed in Bengal and Bombay. This recommendation was approved by the Government; and the concurrence of the Honourable Court and the Government of India having been obtained, 22 men (including some for the Superintendent of Roads), were ordered on the 21st December 1846 to be transferred to the department, though several of the number did not actually join the stations assigned to them till some time later.*

Their number and employments.

44. The number now belonging to the Maramut Department is 25: viz. seven in the first division, and one or two, and in some cases three in each of the other divisions; there are also 11 under the Superintendent of Roads.† They have been employed almost exclusively in superintending work; viz. the construction of buildings, bridges and large works of irrigation, and the making of roads and passes; occasionally they have been employed in making surveys and taking levels, and, in a few instances, in inspecting work done by the Collector's Department. Their services would have been made use of more extensively in the last three modes (in which they were often much wanted, and for which many of the men are well qualified), were it not that being unprovided with either horse or tent, the Overseer cannot be often required to march. When the men first joined the department, their qualifications varied in great measure according to their employment prior to enlistment. Some were very fair surveyors, others were good clerks and accountants, and others were practical artificers; all could read and write, at least fairly, but none were well acquainted with any native language, and few had more than a very meagre knowledge of any.

Results of their employment.

45. The results of the employment of this class have been most satisfactory, both in the Maramut Department and under the Superintendent of Roads. Although much cast down and disheartened by the withholding of promotion, they have displayed a very high degree of activity and energy, as well as zeal and self-devotedness; indeed it is in these qualities, as we have already observed, that they are found so eminently superior to the East Indians. They fearlessly encounter exposure both to the sun and to malaria, in their anxiety to see their work well done. Their intelligence, also, is spoken of in very high terms, and they have established a high character for integrity; no instance of dishonesty has occurred in any of the number, and several, when directly tempted with the offer of a present, have immediately reported it to their superior, or brought the money to him. A few of the number have been remanded to the Sappers for intemperance, but in general they have been quite steady and sober.

Testimony of Engineer Officers in their favour.

46. The following are a few of the general testimonies in their favour, extracted from the replies of the Civil Engineers to our circular;—

Colonel A. Cotton says(a)—"I consider this class, as Superintendents of Work, perfectly invaluable in this country:" and again, "Their willingness, steadiness, activity, endurance of fatigue and exposure, obedience, and complete effectiveness, have been remarkable; and it is evident that there are men among them fit for

* A few men were already employed in the Road Department before the date of the above order.

† In the Road Department there are also several East Indian Overseers, of whom one or two are extremely useful men.

(a) Replies to queries, dated 23d April 1851, Para. 10.

for far superior appointments, and not one that is not worth more than he now gets :" and again, " I am certain that there is not one whose salary has not been saved over and over again in the work he has been employed upon."

Captain Lawford says([b])—" I have no hesitation in stating, that to the ability, assiduity and honesty of my Overseers, I am indebted for the successful completion of the various important works executed in this division since 1847. * * * * * I have never found a duty committed to these men neglected or slurred over, nor have they ever shown the least inclination to disreputable conduct. The natives of all classes evidently respect them."

Major Henderson says([c])—" I have found their services valuable ; and I beg to instance the thorough repair of the Tennary Tank, in which economy and efficiency were both secured through the services of Corporal Cahill. I may also instance the conduct of the late Surveyor Meighan (from the Sappers), who, though repeatedly struck down with fever while superintending the construction of the ghaut at Hussanoor in Coimbatore, would not leave his post, knowing that if he did the work would be deserted by all the people, but continued at the place, taking Warburg's drops, when attacked, till the season ended." And again ([d])—" Their intelligence and skill are generally above that required for their present duties, and if properly directed might be made more valuable to Government. * * * * * Their activity and zeal are generally very great."

Captain Best, Superintendent of Roads, says([e])—" I consider that the employment of the European Overseers has greatly tended to good execution and economy, although the reduction of cost may not have been very great. The bridges on the Southern Trunk Road I believe to be much better built than any that have been constructed under native maistries. The work at the Vellaur Bridge has been inspected by Captains Lawford, Bell, Smyth and Ludlow, and I do not believe that superior work of the sort could be done in England."

Again([f])—" The European Overseer generally possesses an energy which is unknown among the natives, who, placed under him, seem to learn for the first time in their lives what it is to work with a will."

Captain Smyth writes([g])—" I am happy to give a most favourable report of the intelligence, skill, activity, zeal, sobriety and honesty of all those under, or who have been under my orders."

Direct money saving on work superintended by them.

47. The foregoing testimonies refer principally to the general conduct of the Overseers ; it is obvious that circumstances may often prevent a direct and tangible money-saving appearing on the estimate ; the Overseer's work may be only a portion of a very large work, and not susceptible of being shown separately, as at the Godavery Anicut and the Cauvery Bridge ; the estimate may have been framed with special reference to the economy to be effected by European superintendence ; accidents or unforeseen contingencies may prevent the saving from being apparent ; or, lastly, the gain may appear in improved and more substantial work only. Some very marked instances of direct saving have, however, been brought to our notice, and we will mention a few.

The first instance we will cite is ([h]) that of the Trivady Anicut, which was " most excellently built," and in which a saving of *Rs.* 4,130, or above 23 per cent. was effected out of an estimate of *Rs.* 17,859, though in the opinion of the Civil Engineer the whole amount of the estimate would have been required, if the work had been executed under the ordinary superintendence.

A second instance is ([i]) the Dispensary at Salem, built in 1849, where Overseer Reid effected a saving of *Rs.* 1,071 out of a sanction of *Rs.* 2,976, or 36 per cent. It should be added that convict labour was partially employed in this work ; and though a deduction of *Rs.* 381 was made from the estimate on that account, it is possible that more work was done by the convicts than was at first intended.

A third instance is ([j]) furnished by the same officer ; it is that of the Bowany Bridge, over the Cauvery. The work is not yet quite completed, but Captain Smythe and the Board of Revenue anticipate a saving of about *Rs.* 14,000 out of an estimate of *Rs.* 48,790 ; and this very favourable result is attributed, by the Civil

([b]) Replies to queries, dated 22d April 1851, Para. 8.—([c]) Replies to queries, dated 20th May 1851, Para. 10.—([d]) Ditto, Para. 12.—([e]) Replies, 15th May 1851, Para. 7.—([f]) Ditto, Para. 8.—([g]) Replies, 6th June 1851, Para. 12.—([h]) Captain Smyth's replies as above, Para. 10.—([i]) Diary of Assistant Civil Engineer 5th Division, for March 1850.—([j]) Replies as above.

Civil Engineer, in a great measure to the exertions of Lieut. Wilkieson, his first assistant, and the subordinate executive servants, particularly Overseer Reid.

Another instance ([k]) of saving by the employment of European superintendence is that of the Military Hospital at Palamcottah. The estimate for that work amounted to *Rs.* 8,809, and the actual cost was only *Rs.* 7,061, leaving a clear saving of *Rs.* 1,748, or nearly 20 per cent.; after deducting *Rs.* 35 a month for six months and a half to the European Superintendent, who in this instance was not in the department, but was the conductor of stores stationed at Palamcottah.

A fifth instance is ([l]) that of the road from Vizianaggrum to Bimlipatam, superintended by Overseers Robertson and Olive. The estimate for this road amounted to *Rs.* 10,105, and it was made of a greater width than the estimate contemplated, and yet cost only *Rs.* 6,550.

The causes of this result.

48. In all the foregoing cases the estimates appear to have been made at the usual rates,* and it is unlikely that there would have been much to spare from them under the common superintendence. It may be asked, then, to what cause is the saving to be ascribed; is there really this amount of cheating under ordinary circumstances? We believe not: cheating and peculation to a certain extent are no doubt practised in Maramut works; but a large part of the saving effected by means of European superintendence is ascribable to other causes, besides the mere prevention of direct fraud. The skill of all classes of workpeople in this country is at a low point, and their tools are bad: again, all of them are much disposed to loiter over their work, and especially when they are working in large bodies. Now an active intelligent Overseer will correct all this; and to this cause we believe a great part of the result of their employment is due. Thus Captain Best,([m]) speaking of bridges built by one of his Overseers (Brown), states, that by good workmanship and good management every cubic yard of masonry built by him consumed much less chunam, and employed considerably less labour, than the work even of other Overseers; so that there was a saving of 15 per cent. in the cost of the work (even compared with that of other Overseers), while the work was much better, because the joints were closer. In like manner the Assistant Civil Engineer of the fifth division states,([n]) in speaking of the Salem Dispensary, that each bricklayer on an average laid from 800 to 1,000 bricks a day, while, under ordinary circumstances, it is thought very good to lay 500. And in the case of the Bimlipatam road, above mentioned, the saving is ascribed by Lieutenant Rundall ([o]) to the cheaper cost of materials, by a proper distribution, and strict supervision of the labour employed.

The workpeople like them.

Nor is this economy of labour produced by harsh or severe treatment of the people; on the contrary, employment under the Overseers appears to be peculiarly popular. Thus Lieutenant Rundall states, in the case of the Bimlipatam road, that though at first no more than 100 or 200 people daily could be obtained, and that under compulsion, yet as soon as it became known that the hire was regularly paid every evening, the people came in crowds, and within 10 days there were 2,000 voluntary labourers every day.

The least beneficial results are in the 2d and the 8th divisions.

49. The instances in which the service of the European Overseers appear to be least appreciated, and in which little or no money-saving appears to have resulted from their employment, are the second and eight divisions. The cause of this however is apparent, viz. that the Overseers have not been judiciously employed, or their services made the most of. In the second division ([p]), (or more properly speaking in the Nellore district, for the Civil Engineer confines himself to that), the Overseers take no part in the preparation of materials, and are even stated by the Civil Engineer to be incapable of judging of the proper prices.([q]) It further appears that they exercise little power to scrutinise materials, and reject such as are bad; and the Civil Engineer also states, that they are so little acquainted with their business as to be dependent on the Maistries,([r]) and to be consequently afraid to interfere with them or oppose their wishes. Of these Maistries the same officer says:

([k]) Replies of Captain Horseley, dated 9th April 1851, Para. 10.—([l]) Letter from Lieutenant F. H. Rundall, 16th May 1851.

* We should except the roofing of the Palamcottah Hospital, the estimate rate for which is stated by Captain Horseley to have been slightly above the ordinary rates of the district, having been entered by the chief engineer at the Presidency.

([m]) Letter to Government, 1st May 1851, No. 91, Para. 52.—([n]) Diary for March 1850.—([o]) Letter as above Para.—([p]) Captain De Butts' Replies, 22d April 1851, Para. 10.—([q]) Letter from the same officer, 15th May 1851, Para. 3.—([r]) Replies as above, Paras. 11 and 13.

says:(s) "They seldom use any exertions to reduce the prices of materials, nor do I know any instance in which they have reported that the materials were of an inferior description." Captain De Butts bears testimony to the honesty and sobriety of the Overseers, and to the interest they take in their work; and we cannot but think that if they were more trusted, and better supported by their superior officer, they would be found able to do as much as their comrades in other districts, and would show themselves capable of acting independently of Maistries, and above the necessity of tacitly allowing their dishonesty.

In the 8th division the mode of employing the Overseers appears to us to be still worse. (t) The Civil Engineer informs us that works are there generally given to some native bricklayer or contractor; and this not by competition, but at the estimate rates, almost as a matter of course, because the rates being known no one will offer for less. (u) The Civil Engineer further states his opinion, that under an honest and active European Overseer, having charge of the payment for materials and workmen, as well as of the work itself, a proportionate saving might be effected in the execution of considerable buildings, to that noticed above in para. 47, in the building of the hospital at Palamcottah.

Remedy suggested in both instances.

50. In these two divisions we are of opinion, that the existing mode of employing the services of Overseers should be amended. We think that in every large work on which an Overseer is employed, he should be charged with the payment of the workpeople and the keeping of the accounts; that he should be empowered to reject inferior materials, and determine the price of all, with a right of appeal to the Civil Engineer by any dissatisfied party, and that whenever practicable the materials should be provided by him. Independently of the direct saving to Government, which we believe would result from such a practice, we think that it would have a very beneficial effect on the execution of all works; on the one hand, a standard would thus in time be obtained in each Talook, for the proper cost of all descriptions of materials and labour, and, on the other, artizans and other workpeople would both learn to work in better modes and with more industry, and being here accustomed to full and prompt payment, would not quietly submit to delays or exactions on other smaller works.

The habits of the Overseers as to temperance.

51. There are two very important points for inquiry with respect to this class of Europeans; their sobriety and the effect of the employment on their health, and to both these we directed our inquiries. As regards their sobriety, the testimony we have received has been on the whole very gratifying; some men have been intemperate, and have been remanded to the Sappers; but the men more recently brought into the department appear to be superior in this particular as well as in others, to those first appointed to it.

Their health.

With respect to the health of the Overseers the general opinion of the Civil Engineers appears to be that it does suffer; but all point out how unfavourably they are situated, in not being allowed even the shelter of a tent. On the whole there seems reason to believe, that though the men do seem to be affected to some extent by the exposure to climate which their employment involves, yet that with the simple and ordinary precaution of allowing them tents, and some other trifling indulgences which we shall speak of below, and with a little more caution on the part of the men themselves, in restraining their zeal and avoiding unnecessary exposure, a temperate man will retain his health as well in the department as in cantonment life.

They have not been fairly treated.

52. We have mentioned above (para. 45), that the Overseers are disheartened by the withholding of promotion; and we will state the circumstances which have occasioned that feeling. When their employment was first authorised, it was ordered that they should be in four classes: the civil pay of the first and of the fourth class were provisionally settled, the former at *Rs.* 43, 15 annas, 1 pie, and the latter at *Rs.* 90 a month; that of the two intermediate grades was left for after consideration. (v) All men transferred to the Maramut Department were properly placed in the lowest grade, with the prospect and promise of promotion; but up to this time nothing has been done towards completing the arrangements, or fulfilling the expectations then held out. Some men have been in the department

(s) Replies as above, Para. 15.—(t) Replies 9th April 1851. Letter 28th April.—(u) Letter as above, Para. 5. (v) Letter from the Board of Revenue to Government, 20th August 1846, No. 544. Extract Minutes of Consultation of Government, 15th September 1846.

ment nearly five years, have given uniform satisfaction to their superiors, and have been again and again strongly recommended for promotion, both by their immediate superiors and by the Board of Revenue; but not one man has yet been advanced from the lowest step of rank and pay.

Hence discontent and despondency among them.

53. This treatment has produced its natural effect, of despondency, discontent, and disgust with the service. And it has affected not only those men who ought to have been promoted already, but even the juniors of the body, who see in their case what they have themselves to expect. The life of an Overseer is not such as to tempt men to the employment for itself; it involves much personal inconvenience and hardship, great isolation from companionship, and, to some extent, even the severance of domestic ties. And it is stated that many Overseers, seeing no chance of advancement in the department, would gladly leave it for the worse paid, but more quiet and stationary appointment of Serjeant-Major; and that some even would willingly return to the Sappers. One instance is mentioned by Colonel Cotton, of a man, "In every way most effective, and with health and strength for anything," who gave *Rs.* 500 for his discharge, and went home to begin life again, because he found himself cut off from all hope of advancement in this country. The men naturally compare their own circumstances with those of their more fortunate contemporaries, who went to Bengal or Bombay, many of whom are already promoted a grade, or even two above them, while all are in the line of promotion; and they cannot but look with discontent at their own condition, receiving as they do actually less pay than an East Indian boy just out of the survey school, and this without any prospect of improvement.*

It is most desirable to remove the causes of these feelings.

54. Under these very discouraging circumstances we think it a matter of surprise, and highly creditable to the men themselves, that they have behaved so well; but it is important in every point of view that this state of things should not continue. Not only must it affect the activity and zeal of the men, but there is reason to fear that it would operate on their integrity also; that some, at least, of the number, made sore by the feeling of being unfairly treated by Government, would be induced to give way to the temptations coming in their way to pay themselves. We need not point out how much such a consummation is to be deprecated, or how prejudicial to the interests of Government would be the demoralization of a European branch of the service, in which so much confidence must be reposed.

We trust, however, that the Government will now be induced to take up the subject, and to relieve this very deserving class from the causes of discontent under which they suffer. In a subsequent part of this report we shall have to return to this subject, and to detail our views both as to the organization of the body, and the scale of pay and allowances proper to be granted to it. We shall at the same time consider the very important subject of the instruction of the men in the theory and the practical parts of their duty, and in the native languages, as well as the qualifications which ought to be mainly looked to in selecting men for the corps in England. We shall also discuss more fully the best manner of dealing with the Surveyor class.

The mode of executing works in the Revenue Department.

55. We come next to speak of the execution of work. In our notice of the Civil Engineer's Department, we have already (para. 30 to 33) given a general view of the duties of Tahsildar and his subordinates in connexion with public works. We will not repeat what is there said, but will add some further particulars, with the view of fully explaining the existing system. In reviewing the accounts of the department, we shall hereafter examine in more detail the machinery for executing works and its actual operation, and we shall then suggest various material changes from the present system.

The Tahsildar is the Executive Officer.

The Tahsildar must be regarded as the Executive Officer, and the Collector as the controlling authority over him. The Collector empowers the Tahsildar to undertake a given work, and places funds at his disposal for the purpose; but it is the Tahsildar who makes contracts and engagements for materials and labour; it is he who is responsible that the work is done, and done properly and in time; and he in the first instance receives and checks the accounts of expenditure.

A Tahsildar's

* Since this was penned nine of the Overseers have received an addition to their pay, but still no rules for promotion and increase of pay for this useful class have been drawn up.

His jurisdiction and general duties.

A Tahsildar's division or Talook ranges generally from 350 to 600 square miles, contains from 100 to 300 villages, with from 200 to 300 works of irrigation, and yields a revenue of from one lack to two and a half lacks of rupees. He has a treasury and an establishment of servants, some for accounts and correspondence, others stationed out in the Talook in charge of subdivisions of it; the latter are called by the various terms, Peishcar, Zillahdar, Turrufdar, Carcoon, and others. And all the village officers are likewise under his orders. Almost all the powers which a Collector exercises, fiscal, police, judicial and miscellaneous, are confided in a minor degree, and within the range of his more limited jurisdiction, to the Tahsildar, who may be described as the Collector's Deputy within his Talook.

The several steps towards the execution of work.

56. When the Collector gives orders to the Tahsildar to execute a certain work or number of works, he sends him at the same time a copy of the estimate (unless it is one that came from the Tahsildar), and in the case of a new work, of the plan likewise; he also directs his cash-keeper to pay the Tahsildar on application a certain sum, usually half the amount of the estimate. The Tahsildar then sends his receipt to the Collector's treasury and receives the money, and proceeds to make arrangements for the work. In the case of all works of moderate amount, *i. e.* under *Rs.* 300 or 400 (and these are the most numerous), the village officers have charge of the execution. In the case of earth or rough stone-work they produce workmen before the Tahsildar, who execute agreements and receive advance; in the case of masonry the village officers generally undertake themselves to provide materials, and receive advance for the purpose. A copy of the estimate is also given them, as well as the list of the materials required, the latter drawn up from the estimate by the Talook Maistry. In larger works the Tahsildar himself makes agreements with brickmakers, lime-burners and other tradespeople for the supply of materials, and advances them money on bond and security. He also engages workmen, aided by the village officers.

The Maistry's duties in connexion with it.

57. The Talook Maistry shows how the work is to be done; in the case of earthwork, marks out with pegs the line of the channel or bank, and gives sections;* pointing out also where the earth is to be dug in the latter case, and to be deposited in the former. In the case of masonry works, he also inspects and reports on the materials prepared before the work begins. During the progress of the work he visits it from time to time, noticing mistakes or backwardness, or giving further instructions as required; indeed, during the working season he is continually on the move. He records all his proceedings in a diary, which is sent to the Collector once or twice a month (the practice varies in different districts), and on which such orders as seem necessary are sent to the Tahsildar. Progress reports monthly or half monthly are also sent by the Tahsildar to the Collector, showing for each work what advances have been made, what materials collected, and what work done, with explanation of delay.

The Accounts.

58. With regard to the Accounts; in all earthern embankments, and in revetments, anicuts, calingalahs, &c. of rough stone, the work is done by people of a particular class, who contract for it by the cubic yard, and no detailed daily accounts are required. As to masonry work of small amount, such as is executed by the village officers, the accounts are kept by the curnum or village accountant; in larger works there is generally an officer specially appointed by the Tahsildar to the work, who keeps the daily account. In such large works it is required to be sent to the Talook Cutcherry every day, every five days, or every 10 days, according to the district practice; but the time does not appear to be very strictly adhered to. It is from these accounts of expenditure that the accounts of the cost of the work are ultimately made up; the latter are prepared by the Tahsildar and forwarded by the Collector, with a measurement and survey report by the Tahsildar, or some of his department, and the Maistry. In the case of earth and rough stone work, the measurement and survey report alone is sent. In the Collector's office the accounts are examined, compared with the district data, and with any remarks that may have been made on the work or the materials by the Civil Engineer; they are sent back to the Tahsildar for correction if found erroneous;

* In making or repairing banks, it is of importance that firm soil should be used; and in the case of channels, the earth dug out must be carried a certain distance from the edge and laid in a regular line. Hence the necessity for the Maistry's services in this part of the work.

neous; explanation is required of any excess above the estimate; and finally, the bill is sent through the Civil Engineer to the Board of Revenue, to be submitted to Government for sanction. It should be observed that most works of any importance, and not a few small works, are visited by the Civil Engineer or some of his subordinates while in progress; and most works of considerable amount are inspected by the Civil Engineer or his assistant after completion. The officer examines the quality of the work and takes its measurement; he also investigates the rates charged for materials and labour, and the quantity of both.* His report goes to the Collector; and the accounts are audited agreeably to his remarks, unless in any particular he shall appear to be mistaken, in which case a reference is made to him, and ultimately, if necessary, to the Board of Revenue.

Inspection by the Civil Engineer.

59. The foregoing is the general course followed. The details vary slightly in the several districts, according to local practice or local circumstances. We now proceed to make some observations and suggestions on the various parts of this course; and in so doing we shall notice such local peculiarities of practice as may seem to need remark.

Some remarks and suggestions.

One of the chief inconveniences in the existing system of executing public Maramut work is dilatoriness; and this is more particularly the case with those smaller works which are executed by the village officers. It is difficult to obtain the attendance of these officers at the Talook Cutcherry with workpeople to receive advances; and when that is done, the work sometimes is not commenced or materials provided for months: hence, work which ought to be completed in May or June is not begun till June or July, and is hardly completed before the monsoon. In former times there is no doubt that the money received as advance was misapplied, either in payment of Government revenue, or in small loans, or in the purchase of grain for sale, to the personal profit of the recipient; cases of such malversation appear to be now rare, and we think the delay is to be chiefly ascribed to the procrastinating bent of the native character. Other causes sometimes exist, accidents or difficulty of agreeing with workpeople, &c. The delay occurs less in those districts where a good system has been established, and where the village and other officers have more experience in such work: in other districts the attention of the Collector is required, and if that is given, and due notice is taken of delay the practice will in no long time improve there likewise. So also of the delay on the part of the Talook officers, it does not appear to be the opinion of any of the Collectors that Maramut money in the Talook treasury is now misapplied to private purposes. And it appears to us that if the periodical returns of the Talook treasuries are duly scrutinized at the Collector's office, and if the treasuries themselves are examined occasionally as opportunity occurs, such mis-use will be too hazardous to be attempted.

The dilatoriness of execution.

60. In order to get a real *bonâ fide* knowledge of the actual cost of a work, correct and trustworthy accounts of the detailed expenditure are essential, and these can only be framed from faithful daily accounts. The accounts of work done in the Maramut Department appear to be very irregularly kept. As regards the daily accounts, the practice varies; no Collector believes that they are accurately kept for the smaller class of irrigation works which are executed by the village officers; in some districts the semblance of writing them is maintained, but they are not thought worthy of much trust; in other districts such works are undertaken by the village authorities at the rates of the estimate, being measured and paid for by the cubic foot, and no detailed accounts are asked for. In point of fact, we believe works of this class are thus done in a manner on contract by the village officers or meerasdars in all districts, and that where daily accounts are prepared they are not to be relied on. We are far from thinking, however, that where good work is ensured by strict after inspection, these works are a source of gain to those who thus undertake them; on the contrary, there seems reason to believe that they frequently cost more than the estimates, especially in remote villages, where bricklayers, &c. have to be brought from a distance; but as the work is beneficial to the village community, they willingly bear the additional cost. We do not recommend any change in the present mode of executing these works; but it is obviously desirable that the estimates should be carefully made on correct data.

The accounts are irregularly kept.

61. In

* The Surveyors also are employed to inspect work done; but their examination and report are not in general very minute or critical.

The daily accounts, how kept.

61. In the larger works it is of great importance that the daily accounts should be correctly kept, as it is clear that, without them, trustworthy accounts of the total cost cannot be obtained. Yet great laxity prevails with respect to the daily accounts even of these works. The practice varies in different districts: generally it may be stated that the Talook officer in charge of the work writes the daily accounts and sends them to the Talook Cutcherry every day, or every week or 10 days, according to the importance of the work and the practice of the district; but the proper time of sending them does not seem to be very strictly observed. In some districts some pains have been taken to ensure these accounts being genuine; thus in Canara, the officer in charge of a work is furnished with a blank book, of which each page is numbered and signed by the Tahsildar, and in this the daily account is entered, and it is sent to the Tahsildar with the accounts of the work. In Trichinopoly, at large works, a list of all the people at work is sent off to the Talook Cutcherry in the morning, and a list of the hire paid them is dispatched in the evening. In Guntoor, the officer in charge has a book, each page being numbered and having the seal of the Collector, in which the daily account is written; every evening two copies of the day's entries are made and dispatched, one to the Tahsildar, the other to the Collector.

Of these precautionary measures, as well as of the daily transmission required in some other districts in large works, it is to be observed that, if strictly and honestly worked, they provide against tampering with the accounts after they are once written, and with the exception of the Canara plan, they ensure that the accounts shall be written on the very day that they refer to; and these two points are very important.

With the above exceptions, very little attention is paid to the daily accounts. They are sent to the Talook Cutcherry by the officer on the work very irregularly; in some districts they come to the Collector's Cutcherry, in some they do not; but even where they do, very little use appears to be made of them except in Guntoor, where, it is stated, the abstract accounts finally sent in from the Talook are carefully compared with them.

Not generally very trustworthy.

62. The opinions of the Collectors vary as to the degree of credit due to these daily accounts: some think that they are generally authentic; but the majority express the opinion that they are not very faithful or exactly kept, and the Civil Engineers express the same conviction still more strongly. It is obvious that, if each day's account were written at the time, as it ought to be, the whole could be produced at a moment's notice on the requisition of an officer visiting the work, either during its progress or after its completion; but, in point of fact, they are not so produced. Almost all the Engineer officers say that it is their practice to ask for the daily accounts, but that they are seldom forthcoming at once, and often are not to be obtained at all; showing that either the accounts are not written, or that it is not convenient to expose them to inspection. The Civil Engineer of the Eighth Division states that a frequent excuse for the failure to produce the accounts is that the prices of the materials cannot be accurately determined till the work is finished, as some have been used and some remain on hand. This excuse is obviously bad; the fact alleged would not prevent the preparation or exhibition of accounts of the workpeople employed and their hire, or of the quantities of materials received and expended. Even their value also could be shown if the prices have been settled beforehand; and no reason is apparent why they should not be so settled, except that they are to be cut down, if necessary, at last, to bring the total expenditure within the estimate, or within the amount allowed by the Civil Engineer on his inspection or measurement.

The final accounts also frequently garbled.

63. In reply to the question how far the final accounts of works are genuine, opinions also differ. Some Collectors think that the final accounts are fairly made up from the daily accounts; while others, and all the Civil Engineers, declare their belief that they also are garbled. We should observe that this opinion is expressed most strongly by the officers of the Northern Division, where we believe the native public servants are much inferior in character to those of the South. Colonel Cotton mentions one instance, in which, "when an account of some work showed a palpable disproportion of some class of workman, the Gomastah said very simply that he would correct the accounts by altering the proportions." On the whole, we believe that this "cooking" of accounts does take place very generally, to balance the several items and bring them into conformity with the estimate; and we believe also that the total is sometimes altered, though less commonly, to bring it

it within the estimate when the actual cost has exceeded it, or to raise it nearly up to the estimate when it is materially less.

The means of correcting these evils.

64. This is a state of unsoundness which calls for a remedy; and we think much may be done to effect improvement, if the attention of Collectors and Civil Engineers is steadily directed to this point. In the first place, it is necessary that estimates should be carefully made with reference to the peculiar circumstances of every work or locality, and not upon the same data for an extensive district; and strict agreement between estimate and bill ought not to be insisted on, as that directly encourages tampering with accounts. The daily accounts may likewise be much improved in form, and those for works of the same class may be made everywhere uniform. The tabular form should be adopted, and we think that the use of English should be introduced, for the figures certainly, and probably at no distant period for the headings and remarks also. The knowledge of English necessary for this would be very small. We attach much importance also to the inspection of the daily accounts of a work by officers of the Civil Engineer's Department. An officer visiting a work, whether in progress or completed, ought invariably to call for the daily accounts, and should record in his diary the particulars and amount of the expenditure up to that date, and whether they agree with what he sees and learns upon the spot; and he should affix his signature to each leaf of the accounts. If they are not produced, he should state in his diary the fact and the reason assigned for it, and the Collector should not fail to take due notice of the circumstance. It should also be made generally known that any instance of fabrication or falsification of accounts, at any stage and by any officer, would be signally punished. We believe, however, that the most effectual means of checking this and other mal-practices will be the extended execution of works by European agency; but to this we shall have to refer more at length below.

The data tables.

65. We will next advert to the data tables; these are lists showing the quantities of materials and labour, and the value of each, required to produce a given quantity of work of each kind, as, for example, a cubic yard of brickwork or a square of roofing. All estimates are framed from these tables, and they are much used also in valuing work done; it is obvious, therefore, that their accuracy is of importance; yet they have not received sufficient attention. In some districts there are complete data lists, in others, the tables so called are mere lists of the prices of materials and labour; in some districts there is a table for every Talook, while in others there is only one for the whole district. Some of them are of very old date, and few have been revised more recently than 1843.

They require revision; their legitimate use.

Without going into detail, we think that the information we have obtained respecting these data tables fully justifies us in stating that they ought to be thoroughly examined and revised. Not only the prices of labour and materials should be carefully ascertained, but the quantities also; and the revision should be made by the Civil Engineer, in communication with the Collector. When thus corrected, the data tables will be very useful as a standard; but even then they must not be too closely adhered to. They never can pretend to be anything but an average; and in making an estimate, an officer should always consider what are the local or peculiar circumstances of the work, and how they will affect each particular that enters into the calculation; and the rates allowed in the estimates should be modified accordingly from the data rates. But however carefully this is done, perfect accuracy cannot be obtained; for at best, an estimate can only represent probabilities, while the actual result will be affected by contingencies of season and weather, which can never be foreseen. Again, we have already pointed out how much more work is done, and how much material is economized, by good superintendence; but that good work can be obtained only in rare instances, while the estimate must be framed to suit ordinary circumstances. Further, in inspecting a work, the same attention must be paid to actual facts, and too rigid agreement of cost, either with the estimate or with the established data, must not be insisted on.

Compulsory labour.

66. This brings us to the question how far the existing rates of remuneration for labour are sufficient; how far the labour employed on public works is voluntary, and how far otherwise. On these points we called for the opinions of Collectors and Civil Engineers, and on these as on other points those opinions are various. The circumstances of different districts vary; thus in Malabar and Canara the people in general are stated to be too independent to work for insufficient wages. In Madura, it is stated that though the rate is lower than is given by private

employers, the people work willingly for it on the irrigation works, because the improvement of those works benefits themselves. On the whole, however, there appears to be no district in which the labour is not more or less obtained by compulsion: little actual coercion is used, but it is known that it will be used if required; and indeed the workpeople themselves, from long custom, consider themselves under a sort of obligation to work for the Government on the established terms; but where the remuneration is inadequate, they work unwillingly and slowly.

The causes of it.

67. For this practical insufficiency of the hire there are several causes.

In the first place, the rate allowed is too low in some districts, as in Madura, where it is stated to be one-third under the rate paid by private persons.

Secondly, short measurement is taken in measuring work, so as in fact to make the rate still lower.

Thirdly, artificers, bricklayers in particular, are often required to leave their own town, where they could get constant work, to go to a distant part of the Talook, to be separated from their friends, and to submit to privations; and after all get perhaps less wages than they would have earned at home.

Fourthly, There is great delay in paying workmen. Colonel Cotton mentions a case in which, when an officer took charge of a work from the Tahsildar's people, he found the Coolies *Rs.* 2,000 in arrear, and no intelligible accounts forthcoming. After a work is completed, it is often months before the accounts are closed; and even then the workpeople are often not paid their full hire, for the Civil Engineer has still to examine the work; and a part of the amount due for materials and labour is kept back till after his visit, to meet any retrenchments that he may make. This is one of the most effectual reasons why employment on public works is unpopular.

Lastly, There is no doubt that the full hire, as set down in the accounts, does not reach the workpeople; but that they submit to a deduction from it, which in all districts has become customary, for the benefit of the various officers employed on or about the work and in the disbursement of the money. The proportion thus deducted varies in different districts and in the same district according to the vigilance, activity and accessibility of the Collector, and the ability, honesty and boldness of the Tahsildar; but we believe it has, in no case, been wholly stopped, even temporarily.

The means of preventing it.

68. The remedies for most of these defects are at hand.

First. Where the rate paid for Government work is lower than that common in the locality for private works, it should clearly be raised. Mr. F. N. Maltby, of Canara, justly observes, that in fairness Government ought to pay more than private individuals, because they require better work, and because there must often be some delay in paying wages, and the price of materials, except for the commonest labour. We believe, however, under the circumstances stated below, in the next paragraph, the cases will be few in which an increase of rate will be necessary.

Again, fair measure ought undoubtedly to be taken. The practice of undermeasuring by the Talook officers is caused by their fear that the Civil Engineer will allow less than they, and that they will be blamed, while they expect approbation if they keep down the cost. Where a Civil Engineer or his assistant himself inspects work, and sees it measured, not leaving too much to his Maistry, the measurement will be correctly taken; but where the Civil Engineer's measurement exceeds that of the Tahsildar, the latter appears nevertheless to be generally adopted in the bill. This practice is wrong, and should be corrected.

Thirdly. Where workpeople are required to leave their homes, and go to Government work at a distance, it is obviously no more than fair that the hire paid them should be increased in proportion. This will never be the case, to any great extent, except in the instance of works of great magnitude.

Full and prompt payment.

69. Fourthly and Fifthly. These are the real abuses which require to be guarded against, and the cure is not difficult. We have abundant testimony, that in general where the existing rates are paid promptly and in full, they are sufficient to secure plenty of voluntary labour. Thus, in some unhealthy parts of the Coimbatore District, some large works had been delayed or stopped from the impossibility of getting labourers; but when an active European officer (Lieutenant Chauncey) was placed in charge, he obtained as many men as he wished for.

Again,

Again, Lieutenant Rundall, in the subdivision, states that, in several instances, the Tahsildars have declared that no labourers could be procured to execute work, but that abundance of men flock to be employed in road work under European Overseers. The testimony of Colonel Cotton is to the same effect, and the fact is fully established, that in general where the ordinary rate of hire is paid daily in the case of day-work, or where the work is measured, and paid for at short intervals, in the case of piece-work, and this under European superintendence, there is no want of willing and active workmen. It is true that what is wanted is only the punctual and full payment, and if that is secured, the nature of the agency is immaterial. But, independently of any fraud, even punctuality has never been obtained under native superintendence, or if at all, only in very rare instances, and hence European superintendence is necessary, in order to inspire confidence in the working class. It has hitherto proved impracticable to induce native functionaries to pay for work punctually; they always appear to think that, at all events, it is safest to delay paying money, and they wholly fail to comprehend the evils of delay, its impolicy and its injustice.

The extended employment of European Overseers.

70. The first remedy then which we propose, is the extended employment of Europeans in overseeing work. We have already more than once adverted to the expediency of this measure, and from whatever point we approach the subject of the execution of works, we arrive at the conviction of its importance. We cannot but state our firm belief that it will be found the most effectual means of meeting the several defects of the system on which we have now been commenting. It will introduce fair dealing, confidence and order into the system, instead of the mutual suspicion of both parties now prevailing; it will tend to ascertain and establish proper rates of wages and prices, and fair measurement; it will afford in every district numerous and increasing examples of full and punctual payment for work, and it will furnish the very best materials for correcting the data tables, and judging of the proper cost of work. Its effects will be equally valuable in stimulating the energies of the Maistry class, and in affording encouragement to those among them who wish to do their duty, but are overawed by numbers.

Retrenchment of the workpeople by the Civil Engineer.

71. It also appears to us important in this connexion, that some rules should be laid down as to retrenchments consequent on inspection of work by the Civil Engineer. The practice at present is as follows: some time after the completion of a work—it may be a month, or it may be six—the Civil Engineer, or one of his department, comes to inspect it. He examines the work, compares it with the plan and estimate, takes measurements of all its parts, scrutinizes the quality of the materials and workmanship as well as he can, and looks over the accounts, if they are forthcoming; after this detailed examination, he enters the results in his diary, with a valuation of the work, perhaps made with more or less careful reference to the peculiar circumstances of the locality, perhaps with none at all.* This report goes to the Collector, who thereupon, except in rare cases, adopts the Civil Engineer's valuation of the work; and where that is below the cost as shown in the accounts or the measurements of the Tahsildar, directs the latter officer to recover the difference, and remit it to the Treasury. The Tahsildar accordingly recovers the amount from the village officers, or the workpeople, as the case may be; unless, as frequently happens, the precaution had been taken of retaining unpaid a part of the amount due to them, so as to save the trouble of recovering the money.

It is often unfair.

72. We think the course thus detailed unfair and objectionable. The Civil Engineer's valuation, at the best, is wholly arbitrary; yet he does not hesitate to reduce the rates allowed in the estimate, and on the faith of which the work was done; although, with a little care, the proper rate might generally have been accurately determined, in the case of earth and rough stone-work† at least, quite as well at the time of making the estimate, as he can do it at the inspection, except with the aid of the accounts which he disallows. Careful inquiry at the time of making the estimate would also reduce to a minimum the variation between the estimate and

* In some cases the officer, especially if a Surveyor, merely compares the charge with the estimate. This is wrong; the actual cost ought to be scrutinized, but in a fair spirit.

† The rate of earthwork is determined by the nature of the soil, and the distance and height to which it has to be conveyed; that for rough stone by the last two conditions, and the size of the stones. As the estimate is always made on the spot, these particulars could then be definitively ascertained. They should be noted in detail at the foot of the estimate, especially if that is made by the Tahsildar's department. This is sometimes done now, though not with sufficient care.

and the actual cost in the case of masonry work. And even where the charge for such work is too high, it by no means follows that the workpeople have not been on the work the full number of days set down; it is quite as likely that they were detained idle, because a dawdling Maistry or other officer did not set them to work or provide the necessary materials. Yet, unless the blame can be shown to attach really to the workpeople, they cannot fairly be mulcted of their hire; and it is necessary to justice, therefore, that the inspecting officer should perform this part of his duty with care and discrimination.

Again, the delay of inspection may affect the apparent quality of work done; in the case of a channel or bank, heavy rain may wash down some of the new earth in the one case, or lessen the apparent depth of cutting in the other. But the great evil of delay is that to which we have already alluded, viz., that it keeps the workpeople so long from their due, and then they have to be called away, perhaps a considerable distance, from other work on which they are engaged, and so a further loss, that of time, is entailed on them.

Proposed rules for limiting such retrenchments, and fixing responsibility.

73. In looking for a cure of these evils, it must be borne in mind that even in the case of a real overcharge, the recovery of the amount is by no means the only remedy. The punishment of the Government servant, through whose carelessness or fraud it occurred, though it will not replace the amount in the Treasury, will much more surely tend to discourage a repetition of the wrong. And we think it one ill consequence of the practice of recovering the supposed overcharge from the frequently innocent workpeople, that the conduct of the Government officer, who is often the real offender, too generally escapes notice.

The following, then, are the rules which we would recommend, to do away with the evils above noticed:

First. The measurement and valuation of a work by the Civil Engineer shall be adopted in the bill, where it exceeds that of the Tahsildar by 5 per cent.

Second. No deduction shall be made in the charges for a work on the inspection report of a Civil Engineer, unless his valuation is less than that of the Tahsildar by 10 per cent.

Third. If the examination by the Civil Engineer takes place more than three months after the completion of the work, no reduction of charge shall be made, however much his valuation may differ from that of the Tahsildar, unless fraud be apparent.

Fourth. In every case of a difference of more than 5 per cent. between the accounts of the Tahsildar and the valuation by the Civil Engineer, and specially in cases wherein, under the foregoing rules, the difference is recoverable, the Civil Engineer shall record his opinion as to the parties to whose fault the difference, whether of overcharge or deficiency, is due.

Fifth. In such cases the Collector shall institute inquiry, and shall visit the party appearing to be in fault, if a Government servant, with such reprimand or punishment as the nature of the case may seem to require: if fault appear really to rest on workmen or supply of materials, they shall be liable to be mulcted in accordance with the second and third rules, to make good the amount of the overcharge.

The Civil Engineers should also be instructed, when inspecting works in progress or completed, always to inquire particularly from the workpeople and the suppliers of materials whether they have been duly paid or are in arrear; and shall state the particulars in his diary.

Their operation would not increase the cost of works.

74. We think that these rules, if fairly acted on, would correct the evils we have noticed in the present system, and would tend to make employment on Government works more popular than it now is. We should add, that we fully believe that the cost of works would not be increased in any perceptible degree by the second and third rules. The vigilance of the Tahsildars and other Talook officers would be increased by their augmented responsibility under the fourth and fifth rules; and overcharges would probably never occur, except in those cases of gross fraud, wherein all the parties concerned would be as fully liable as at present both to refund and to punishment. It may be added that even now the aggregate amount of recoveries consequent on a Civil Engineer's report is by no means large; the great practical evil of the system is the plea which it affords for withholding payment from the workpeople.

75. The

The District and Talook Maistries.

75. The Maistries constitute a very important branch of the Executive Department, and we must notice them at some length. Like every other part of it, their position and duties have undergone material change during the last 30 years. In the early periods of the department, they were simply head-bricklayers, who superintended the execution of the few masonry works, and probably often accompanied the Tahsildar when he went to measure earthwork. As the department grew, and became more effective and better organized, the duties required to be performed by the Maistries became more extensive and more important; but no commensurate improvement, and little improvement at all, took place in their qualifications. Hence the want of proper men to execute their projects has long been a grievous complaint with the Civil Engineers; and these complaints have been noticed by Government, and have even attracted the attention of the Honourable Court of Directors. The necessity of giving the Maistries some preparatory training has repeatedly been urged on Government, but nothing has been done. The recent order of the Board of Revenue, requiring that before nomination a Maistry shall obtain a certificate of qualification from the Civil Engineer, was a step in the right direction; but as it was not accompanied by the provision of any means whereby the men could obtain preparatory instruction, its good effect has been very limited.

The Superintendents of Maramut.

76. The number of Maistries at present in the 14 irrigation districts is 79; besides 12 Superintendents of Maramut, viz., one to each district, except Nellore and Guntoor. The appointment of Superintendents of Maramut is of comparatively recent creation, but they are a very valuable class of officers. They have almost invariably been brought up in the Civil Engineer's Department, and served some time as Maistry to a Civil Engineer, being thus in immediate and constant communication with him. As Superintendents of Maramut, they are under the immediate orders of the Collector, and are usually employed as follows: at the proper seasons they go round the district to make estimates, or to examine work done; they make surveys, and take levels, when ordered to do so, for the use of the Civil Engineer; they are called on occasionally to report to the Collector on any improvement or new project proposed: they prepare plans of works; and, lastly, they are occasionally placed to execute large and important works. Thus they are the native head of the department under the Collector. They keep diaries of their daily employment, with remarks on all the works which they look at, and these diaries are submitted periodically to the Collector.

Their duties.

The Talook Maistries.

77. The Maistries are stationed out in different parts of the district; each one on the average has charge of the work in $2\frac{1}{2}$ Talooks, being, together, about 1,280 square miles in extent, and containing about 1,000 works of all kinds, besides hundreds of miles of road. His duties in connexion with this charge are as follows. He ought to be acquainted with the position and state of all the tanks, channels, and other works; he has to visit all from time to time, especially such as are reported to be in need of repair: if the Civil Engineer does not visit the Talook at the proper season for making estimates, they must be made by the Maistry; when work is ordered to be executed, the Maistry is required, as already said, to point out precisely how it is to be done; and he has also to visit and report upon it frequently while in progress: and, finally, he takes the measurement in most districts, either in company with the Tahsildar, or independently. In the case of considerable works, the Maistry is also frequently stationed to superintend the execution. He is required likewise to make surveys and estimates, and to take levels for the repair of roads, to be subjected to the revision of the Civil Engineer.

Their defective qualifications.

78. The foregoing detail gives the work that the Maistries have to do, but it is only repetition to say that very few of them possess the qualifications necessary for the efficient discharge of such duties. Except two or three Collectors, who make no complaints, the unvarying testimony from every district is, that the Maistries are "incompetent," "untrustworthy," "little better than common bricklayers," "totally wanting in zeal and energy," "unequal to anything but routine duty." The opinions of the Civil Engineers, who have ample opportunity of knowing the Maistries, are still more strongly expressed to the same effect; and there is no doubt that, as a body, they are very inefficient; yet, bad as they are, there is such a total want of any qualified class from which to obtain men to fill vacancies in the list, that bad and useless men are retained, simply because, if they were discharged, no men, even so good, could be got in their place. Almost, if not absolutely, the few

few Maistries who have been efficient are such as have had some training under a Civil Engineer; and even they have generally been wanting in one important qualification, viz., that as the civil Engineer's Department is not executive, they have had no opportunity of acquiring practical acquaintance with bricklaying or building.

Reasons of their general inefficiency.

79. A Maistry properly qualified and properly supported by his superiors is a very valuable officer; not only on account of his own work, but also from the check which he enables the Collector to exercise over the Maramut proceedings of the Talook Revenue officers. But this advantage has been, in fact, attained very rarely; partly because, in many districts, the Maistries have been placed almost entirely under the Tahsildars, and systematically restrained from acting independently; and, partly, because from their ignorance and utter inefficiency they have been incompetent to assume any other position, even where it was the wish of the Collector so to elevate them. The lowness of their pay, and the small inducement to activity, honesty and self-improvement held out to them, have also tended to keep them down.

The means of improving them.

80. In order to raise the Maistries, and place them in that position of usefulness which they ought to take, it is necessary both to improve their personal qualifications, and to give them a more independent and respectable position; it will also be necessary to increase their salary and their number. In the first place they must be suitably educated and trained for the duties they will have to perform. The necessity of this preparation seems so obvious, that it is matter of astonishment that it has been so long and so greatly neglected. The utter ignorance and inefficiency of the present class of Maistries has long been notorious to every officer brought into contact with them; and it has repeatedly been brought to the notice of the higher authorities. But yet scarcely anything has yet been done to improve them: and the very little that has been effected, has been the result almost exclusively of the unaided efforts of individual officers. Of late years several of the Civil Engineers (especially Captain Horsley, in the 8th Division) have made it a practice to take volunteers in their offices as they could get them, for the purpose of forming Talook Maistries. These youths, who are generally the sons or nephews of old Maistries, see all the works inspected by the Civil Engineer, as well as his office work, and get a little instruction from himself, or his Overseers, or Maistries in engineering, estimate making, surveying, drawing, &c. Having no salary, they are seldom disposed or able to remain more than six months or a year at the utmost; and it shows forcibly both the utter inefficiency of the existing class, and the absence of fit candidates, that with the small amount of knowledge so picked up these youths are gladly entertained by Collectors as Talook Maistries; and if of an active turn, are found to be extremely useful.

The system of entertaining youths as apprentices, for instruction.

81. But the most important trial of this sort of training was made by Captain Best, the late Superintendent of Roads, and with very good results. In February 1848, Captain Best obtained permission from Government to entertain six lads as apprentices; and in March 1849 he was allowed to increase the number to 12. The lads were bound to the department for four years, and received *Rs.* 7 a month. And this is the whole amount of the assistance obtained from the Government towards the very important object of giving an efficient training to the Maistries. The apprentices were instructed in surveying and levelling, in plan drawing, in making estimates, and calculating, and in all the practical work of the department. Captain Best wrote to us as follows respecting them:* "The expectations I formed from the employment of apprentices have not been disappointed;" and, again, "They have from the first been worth a considerable portion of their pay." He went on to say that the system was defective at present, in not giving the lads time to apply continuously to practical geometry, drawing, and other branches of education; and the cause of this was the same as exists in the Maramut Department, viz., that he was obliged to employ them very soon as Maistries, in preference to any such Maistries as he could get. At the date of his letter Captain Best had had, in all, 18 apprentices; of these one died, one was allowed to leave the department, and three were dismissed after short periods, six were still under instruction, but two of them had already been employed on some sorts of duty. The remaining seven were in permanent employ in the department as Maistries, or in surveying, and their qualifications were very favourably reported on by Captain Best.

82. This

* Letter, 15th May 1851, Para. 21.

82. This plan of apprenticeships is certainly the best that has yet been adopted for the preparation of Maistries, and its results are particularly encouraging, as proving that apt pupils are not wanting; but still it would be utterly inadequate to meet the evil. Carried out on a scale sufficient to supply the department with Maistries, it would convert the Civil Engineers into schoolmasters; and so would engross a great part of their time, which is already far too short for their own proper duties. But this is not by any means all that is to be said; not one officer in 20 would be found capable of bringing to the irksome task of teaching, the patience and good temper which distinguished Captain Best; and without those qualities the result would be a failure.

More regular and systematic instruction is necessary.

It is said that the work of actual instruction need not engage the head of the office, but might be devolved on the subordinates: it is replied, first, that the consequence must be an inferior sort of instruction, because given by men only half instructed themselves; and, second, that the evils above stated would still remain; the time of the subordinates could not be given up to this work any more than that of the head, without abridging the portion of it available for their proper duty: and aptness to teach is not more common in the lower than in the higher ranks of society.

In short, the interests of Government require that the Maistries, as well as the other subordinate classes, should be well instructed in their duty; and we are convinced that this can be well done only by a systematic course, under regular teachers. In a subsequent part of this Report we shall detail the mode in which we propose to carry out this principle.

We would here only add one remark. It must of necessity be some considerable time before any large system of instruction can be in actual operation; and meanwhile all the evils of the present state of things continue to be a source of heavy loss to Government. As a temporary expedient, therefore, we consider it very desirable that the apprenticing system should be extended. We beg to propose that every Civil Engineer and First Assistant Civil Engineer should immediately be empowered (but not required, for we would leave it to his own option) to entertain not more than four apprentices, on the terms adopted by Captain Best. This would be a great improvement on the present state of matters under which a youth can scarcely get instruction as a Maistry, however anxious to do so. A number of Maistries of a better class would be trained for the department before the establishment of the proposed school; and, on that event occurring, the apprentices still under instruction should be transferred to that institution to complete their course. We think that every officer taking apprentices should be required to report to the Board of Revenue, yearly or half-yearly, on their qualifications and conduct.

But meanwhile the Apprentice system should be continued as a temporary measure.

83. The next thing to training is to improve the position and standing of the Maistries. Hitherto they have almost everywhere, and for the cause above detailed, been regarded as a mere appendage to the Tahsildars, who commonly wish to allow them no independent action whatever. In the Northern division things are still worse: Colonel Cotton states that the whole department, including the Maistries, are treated with the utmost contempt by the Revenue Officers; and the Collector of Rajahmundry states, that he is not aware that he has a single honest man among all his Maramut servants, except the Superintendent. But it is in Bellary that the Maistries appear to be made less use of than elsewhere. Their scale of pay there is liberal compared with what it is in most districts: but, nevertheless, the Civil Engineer states, that they are not employed to make estimates, or to examine or report on works, both being done by Gomastahs of the Tahsildar's establishment on $3\frac{1}{2}$ to *Rs.* 14 a month; they are not even employed to execute the more important works, which are entrusted to Peons or Gomastahs; while the Maistries are looking after one or two small works, and are not allowed to notice anything beyond these. No doubt this state of things is owing in part to the low standard of qualification of the Maistries, of whom the Civil Engineer says, that they can only write their own language indifferently; and that, with one exception, none of them can multiply two units together mentally; but we believe it is also owing, in great part, to the wish of the Tahsildar's department, who are mostly Brahmins, to keep down the Maistries. We are happy to add, that the present Collector appears to be aware of the evil of the present state of things, and we have no doubt that it will be improved.

The Maistries are too much in subjection to the Tahsildars.

84. In order to raise the standing of the Maistries, efficient training and instruction are essential, so as to render them equal to their duties, and enable them both to

They should have separate duties and responsibilities.

to entertain self-respect, and to command the respect of others. But, besides this, the Maistry should be made, in a great degree, independent of the Tahsildar, and should have separate duties and a separate responsibility of his own. The custody of the public works in his Talook should still remain with the Tahsildar, and he should still receive information of every accident, or occasion for repair; but the duty of making estimates should belong to the Maistry, who would be prepared for it by previous training, and not at all to the Tahsildar, who could only do it empirically. Again, as to the execution of works, it should still be the Tahsildar's duty to provide materials and workpeople, and to make other necessary arrangements; but the Maistry should be responsible that the materials were good, and that the work was done in accordance with the plan and estimate; or rather, he should be responsible for rejecting bad materials, and bringing to the notice of the Tahsildar and of the Collector every instance of the use of such, and every departure from the plan, or other fault in execution.

They should correspond directly with the Collector.

85. In most districts it is even now the practice to require from the Maistry a diary of his daily proceedings, which he sends in every week, or 10 or 15 days. In some districts these diaries go direct to the Collector, in others they reach that officer through the Tahsildar or the Superintendent of Maramut. In one district the Tahsildar is required to countersign them, in testimony of their accuracy; in another the diaries go weekly to the Superintendent, and are detained by him and sent monthly, with his own, to the Collector; in a third, where the Maistries' diaries now come to the Collector through the Tahsildar every five days, the Collector states his intention of letting them remain altogether in the Talook in future, and requiring instead a 10 days' inspection report. We think this indirect transmission of the diaries objectionable: one object of requiring them at all, is, to acquaint the Collector with neglect or misconduct on the part of the Tahsildar's department; and this seems quite sufficient reason why they should not come through the Tahsildar. And we can see no sufficient advantage in their going to the Superintendent; he may occasionally add a useful remark for the Collector's information, but he can issue no order to a Tahsildar; and the receipt of the diary by the Collector is thereby much delayed, especially when the Superintendent is on detached duty. On the other hand, we deem it very important that the Maistries should be in direct communication with the Collector; and we think that diaries, twice a month, that they might not be too frequent, should be sent in to him direct; and that the Maistries should also be allowed to address him, by arzee, on sufficient occasion. This would place them in an independent position, and would secure them a fair hearing. After having been seen by the Collector, and orders passed on them, the diaries might be sent to the Superintendent of Maramut, if considered expedient: and we also think it of consequence that an abstract of them in English, showing the daily occupation of the Maistries, should be sent by the Collector to the Civil Engineer.

Their emoluments must be increased.

86. It will be necessary also to increase the emoluments both of the Superintendents and of the Maistry class; and so to graduate those of the latter, that there shall be a reasonable hope of promotion by good conduct; while, on the other hand, degradation to a lower class may be a punishment for neglect or misconduct. The pay of the Superintendent in Tanjore is *Rs.* 100, and in Bellary it is *Rs.* 60; the other Superintendents receive only *Rs.* 50. These salaries are decidedly inadequate to the duties of the office: a Superintendent is required to be very much on the march and away from home, which is peculiarly disagreeable to a native; though he does not himself disburse public money, he overlooks those who do so to a large amount; and much valuable property depends on his activity and integrity. Considering the importance of the duties, the constant absence from home which they involve, and the position that a Superintendent ought to hold in a district, we think his salary should be rather more than that of a Tahsildar of a Talook, that is, that it should range from *Rs.* 90 to *Rs.* 120. We shall also propose below, that the higher appointment of Sub-engineer shall be open to men of this class. Deputy Superintendents will also be required in the larger collectorates.

Scale of pay for Maistries.

87. As to the Maistries, we are of opinion that the lowest grade should not receive less than *Rs.* 15 a month, and that there should be gradations up to *Rs.* 40 monthly; efficiency and qualification being the chief claim to promotion, and length of service secondary to that. We do not propose, indeed, that these salaries should be given immediately, at least not generally, either to Superintendents or Maistries, because

because men worth so much are now rarely to be found. But we recommend that the salaries should be now fixed, and that men should be encouraged to improve themselves up to them; the salaries actually paid being increased from time to time, with the qualifications of the incumbents. We think, also, that the Maistries should not be permanently attached to particular Talooks, but should be borne on the establishment of the Collector's own office, and allotted from time to time to particular Talooks or works, as may be expedient. And we would also recommend, that the duties should be divided in a manner somewhat similar to that which we have already spoken of for the European subordinates; viz., that the Maistries of the lower classes should not be employed in estimating or overlooking work, but should be chiefly confined to executing work, and to making surveys and taking levels on given lines, and in working under the immediate direction of superior officers.

They should be District, and not Talook Maistries.

88. Lastly, it is necessary that the number of the Maistries should be increased. At present the total number in the 20 districts is only 97: the number of works undertaken in 1850 was 5,655; so that on an average each Maistry had to attend to 58 works, or, deducting those for which other superintendence was provided from other quarters, each man had probably 50 works, on an average, and those spread over an area of about 800 square miles. It is obvious that no man living could duly attend to all these works, and the fact consequently is that a great proportion of them are neglected, and that the other duties of the Maistries, which we have described, are almost wholly omitted. At a subsequent part of this Report we shall propose a Schedule of Maistries for the whole Presidency. In doing this, we shall bear in mind the greater amount of efficient work which will be done by men trained as we propose; but even allowing for both these considerations a very material increase of number will be required.

Their numbers must be increased.

89. In the case of particular works, where constant supervision is necessary, but to which the permanent Maistries are too few to attend, it is the practice to appoint hungaumy or temporary Maistries. Some officers express a dislike to this system, on the ground that temporary Maistries are without those guarantees for good conduct, which a permanent tenure of office entails. We are of opinion, however, that the practice must be continued for the present at least, and until the permanent establishment is rendered more equal to its duties; even then, perhaps, it will be impracticable to dispense with temporary Maistries altogether. We believe, also, that where these Maistries are selected from candidates for permanent employment, they will commonly be found careful and correct. Pupils who have made some considerable progress in instruction, or who have qualified, but are waiting for permanent vacancies, may be detached for a time as hungaumy Maistries, as was done by Captain Best; and they will, we are sure, prove very efficient in that capacity.

Temporary Maistries.

90. It may be proper to add, that our remarks on Maistries are not intended to apply to the Civil Engineer Maistries, but to those of the Collector's Department only. Each Civil Engineer, and each First Assistant Civil Engineer, has a Maistry on *Rs.* 35 a month. These men have always been brought up in the Civil Engineer's office, and they are almost invariably very intelligent and efficient, and very far superior to the Talook Maistries. And this difference must be ascribed to the different treatment they have received; for they are almost exclusively from the same class as the Talook Maistries, but have had the advantage of that species of training which we are so anxious to obtain, with some improvement both in quality and degree, for the whole body. They are also in a position of trust and responsibility, and on more liberal salaries than the other class; and they have the prospect of promotion to the post of Superintendent of Maramut, if they conduct themselves well.

The Civil Engineers' Maistries.

91. With an order of Government, in the Public Works Department, No. 183, dated 30th May 1851, we had the honour to receive for consideration, in connexion with the general subject of our inquiries, the papers noted below,* having reference to some proposed changes in the Maramut Department. We have given careful consideration to the proposed regulations, and the present seems a fit place for stating

Some new rules proposed by Government.

* Extract from Minutes of Consultation of Government, P. W. D., January 31st, 1851, No. 48; and Letter from the Secretary to the Board of Revenue in the P. W. D., to the Chief Secretary, dated 10th April 1851, No. 367.

stating our opinion upon them. The Board of Revenue indeed have remarked upon them at some length; and as we concur generally in the views so set forth by the Board, we will avoid repeating what they have urged, and confine ourselves to such further observations as have occurred to us.

Purport of the rules.

92. The purport of the five rules proposed is as follows:

The first directs that no new work or renewal of an old work, exceeding an outlay of *Rs.* 2,000 shall be submitted to Government till the Collector or Sub-collector has made inquiry on the spot, in person, and satisfied himself of the correctness of the data on which the expected return has been calculated. And that it shall be reported whether the Ryots have means to extend their cultivation, if water is provided; and whether such extension will be effected by withdrawing labour and stock from other lands already cultivated.

The second rule directs, that before estimates for new works of irrigation are laid before Government, it shall be ascertained "that the increase of revenue from the works is sure to be such as fully to repay the outlay under all circumstances;" "that the supply of water is certain, and to be depended on;" and, "that the Ryots are able to take advantage of the improvements."

The third rule directs that a Civil Engineer shall confine himself chiefly in alternate years to each one of the two districts of his division; and that the execution of important works in each district shall be mainly limited to those years when the Civil Engineer is within it.

The fourth rule is, that neither the Civil Engineer, nor any of his department, shall attend to or interfere in any work, new or old, of which the cost is less than *Rs.* 1,000; the whole responsibility for such works, as respects both recommendation and execution, being left to the Collector.

The fifth rule directs that periodical reports of the progress of all important works shall be made to the Board; and that all such works, while in progress, shall be visited once a fortnight or oftener, if necessary, by an Assistant Collector.

The first rule inapplicable and inexpedient.

93. With respect to the first rule, we may observe, that the points there indicated for special inquiry and report, are for the most part very necessary to be ascertained before a proposed work is recommended for sanction; the existing rules prescribe such particular inquiry, and the Board seldom fail to enforce it. We think, however, that a rule requiring that this inquiry shall be made on the spot, in person, by the Collector or Sub-collector, is founded on a mistake as to the necessities of the case, as well as a forgetfulness of the territorial extent of a Collector's charge, and the heavy pressure of his duties. The average size of a collectorate is nearly 7,000 square miles; the largest being above 13,000, while two or three are little more than 3,000; the distance in a direct line from one extremity of a district to the other, is in many instances 130 miles; and in not a few, it exceeds 150; in all but the five smallest districts there is a Sub-collector, who has separate and immediate charge of about a fourth part of the district. The Collector, and, in a minor degree, the Sub-collector, cannot, without much inconvenience and delay of business, separate himself even for two or three days from his cutcherry; and his movements must necessarily, therefore, except in extraordinary cases, be limited by their powers of locomotion; *i. e.*, he cannot travel at a greater rate than 10 miles a day, and not even so much for any continuance without very much hindrance to business.

Its probable practical operation.

94. If the rule should ever be put in force, the operation of it in general would be that in the case of works within a moderate distance of his usual place of residence (viz., within 15 or 20 miles), a Collector would go to the spot on horseback, or in a palankeen, as his tastes and habits might incline him, take a hurried look at it, ask a few questions of village people, and then go home again, having the people brought to his cutcherry for more detailed inquiry. As to projects affecting places more distant, they would be postponed till the annual Jammabundy tour; and, as even then, the Collector can only visit the chief place in each Talook, that place would be the centre from which he would pay similar hurried visits to works projected. It is obvious that in this way the operation of the rule would be to postpone distant works in favour of those nearer to the Collector's own residence, which already, perhaps, receive too large a part of his attention. But this is supposing a Collector anxious to improve his district even at the cost of personal inconvenience and accumulated labour to himself. All Collectors, however, are not men of such a character, and with the less active and zealous, the result undoubtedly would be that the reports on projects

projects would be postponed indefinitely, or evaded altogether, and so improvement would be totally stopped.

The rule not at all necessary.

95. Again, any such alteration of the present practice appears to us to be quite uncalled for. In all the various departments of a Collector's duty, he depends for local information, in the first instance, on his Tahsildars; and so in such inquiries as those now under consideration, it has hitherto been considered the duty of that class of functionary to make inquiries as to the extent of land capable of being brought under cultivation by a given improvement, the willingness and ability of the Ryots to cultivate it, and the increase of revenue thence derivable. The Collector scrutinizes the Tahsildar's report; and in any case in which he deems it necessary, requires further information on particular points, calls up the village officers before himself, with their accounts, or perhaps in rare instances, for it is rarely necessary, waits till he can make inquiries himself on the spot. We say such personal inquiry is rarely necessary, for the points of inquiry are simple, and the Tahsildar, acting as he does, under responsibility, is fully competent to make them; and a little prudent caution on the part of the Collector is generally sufficient to prevent disappointment. And this being so, we think the proposed alteration as unnecessary, as we have already shown it to be impracticable.

Past experience does not show it to be so.

96. The present proposed rule, indeed, implies that Government have, in former instances, found or supposed information based on such inquiries to be deceptive: and in para. 12, of the same paper, it is directly alleged that the subordinate authorities "generally fail to place before Government" sufficient information to justify sanction. No instances of the fallaciousness of such information are given, however; and on referring to the records of past experience, we do not find the statement supported by the general result. We will not deny, indeed, that individual cases of failure have occurred, in which a fair return for the money expended has not been realized; but the question must be looked at in a broader aspect; and we would point confidently to the statement, Appendix (Z.), already once alluded to, for proof that generally a just discrimination has been displayed by Civil Engineers and Collectors in projecting improvements and recommending them for sanction. It is seen in that statement that the whole outlay in a series of years in extending irrigation, has produced an average net annual return, at the rate of $69\frac{1}{2}$ per cent. on the first cost, after deducting from the gross receipts the amount of the repairs.

Now in these cases of which the results are so remunerative, the Civil Engineer, the Collectors and the Board of Revenue were satisfied with the evidence of expected profit. And if the Government were not satisfied with it, or if, as it appears, they are not satisfied with similar evidence now, then the inference follows, that the Government are less capable of judging of such cases than the subordinate authorities just mentioned: and this affords an additional and practical reason why the Government should entrust to those authorities a larger share in the determination of such questions, as we shall have to recommend in a subsequent part of this Report.

The second proposed rule.

97. The second rule applies to the same subject as the first, viz., the information to be furnished before a work is sanctioned; it differs from that in requiring absolute certainty both for the supply of water and the increase of revenue. Now, it appears to us that it is only necessary to point attention to this particular, in order to show the impracticability of the rule. Both the supply of water and the consequent increase of revenue obviously depend mainly on season and weather, of which the incidents are inevitably uncertain beforehand to human knowledge. It is like forbidding the commander of a ship to leave port without the certainty of a fair wind all the voyage. But if it be said that the certainty intended is not mathematical certainty, but only a high degree of probability, then we would say, first, that the language of the rule should be qualified; and, second, that even of probability, only so much must be required as the nature of the case permits and warrants. That high degree, which we call a "moral certainty," is not generally applicable to cases such as the present, but only that lower degree which is indicated by the expression "a reasonable expectation."

With respect to the detailed information required by this and the preceding rule, as to the Ryots' agricultural stock and the supply of labour, we will say little here, as we shall have occasion to advert hereafter to the actual facts of the case. We will only remark that, in general Ryots are very ready to take advantage of improved means of irrigation, unless there are special, disabling, or indisposing causes; the chief of which is, not want of means to cultivate, but an exorbitant assessment.

The third rule impracticable; it would take the Engineers from their most important duties.

98. The remarks of the Board of Revenue on the third rule appears to us to show convincingly that it is impracticable; and that, if put in operation, it would produce more harm than good. It seems to have been altogether forgotten, when the rule was penned, that the Civil Engineer is not and cannot be an executive officer, except to a very trifling extent. His chief duties are to project work, to aid the executive officers with professional advice while it is in progress, and to inspect and test it afterwards. If he is to become executive, not only must these very important duties be omitted, but the cost of superintendence on the work so executed, a charge which is already considered by Government to be objectionably large, will be vastly increased.

And we cannot but remark with reference to this and the following rule, that a more emphatic acknowledgment of the inadequacy of the Professional Department could hardly be given by the Government. For it is here declared that such is the insufficiency of that department, as to make it necessary, both to deprive entirely of the benefit of their science and skill five-sevenths of the whole expenditure on Public Works, and also to stop the progress of all such works as are still left under their control, in 10 out of the 20 districts, every year.

The fourth rule; it would deprive by far the greater part of works of all effective check.

99. The fourth rule proposes to relieve the Civil Engineer by entirely withdrawing from his control or interference the estimating for and inspection of all works, new or old, involving a cost exceeding *Rs.* 1,000. And this is enlarged (in paras. 14 and 15) to signify that the ordinary repairs, to whatever amount apparently, shall be entirely out of the jurisdiction of the Civil Engineer, neither to be estimated for, inspected, nor the accounts examined by him. The Board have stated substantial practical reasons against this measure, to which we will add a few considerations.

As it appears likely that, in proposing the rule, the Government were not fully aware what would be the extent of its operation, we have obtained from the Revenue Board a statement, showing, for the year 1850, the number and the aggregate amount of estimates respectively under and above *Rs.* 1,000, and this statement we give in Appendix (T.) It will be seen that of 4,339 estimates for works of irrigation, to the aggregate amount of *Rs.* 6,68,368, only 90 estimates, to the total amount on *Rs.* 1,71,251, were above *Rs.* 1,000 each, while no fewer than 4,249 estimates, amounting to *Rs.* 4,97,117, were under *Rs.* 1,000 each. Thus under the operation of the proposed rule, no less than five lacs of rupees annual expenditure on tanks and water-courses, out of a total of $6\frac{3}{4}$ lacs, would be entirely withdrawn from the interference of the Checking Department.

The operation of the rule, in the case of buildings, would be to a similar extent as to roads; the estimates for that class of works are generally larger, and a smaller proportion, therefore, would be withdrawn from the cognizance and control of the professional department.

It would thus revive former wholesale frauds.

100. In detailing, in a former part of this Report, the past history of the Civil Engineer's Department, we briefly referred to the frauds formerly practised in tank repairs; work was performed that was not wanted, to favour those who obtained the good will of the Tahsildar; and work was charged for that was never performed at all, the money being appropriated to the public servants and their colleagues in the fraud: even where an honest discharge of duty was intended, though there was no wholesale fraud, there was large waste and misapplication of public money, through the unskilfulness of those who planned the work. That these evils have been so very greatly reduced, and the grosser frauds wholly eradicated, is due almost entirely to the active check exercised by the Civil Engineer's Department, and to the aid received from it by the Collector; and should the large class of works above specified be now withdrawn from the cognizance of that department, we can anticipate nothing less than the revival of a large part of the old abuses. And this is an evil much to be deprecated, not only in itself, but in its demoralizing effect on a large body of public servants.

It would greatly stop improvement.

101. Further, we have no hesitation in declaring our belief that the effect of this rule would be to put an almost total stop to a very useful class of works; viz. the very numerous improvements or extensions, varying in amount from *Rs.* 200 or 300 to *Rs.* 1,000, being for new sluices or calingalahs, cutting through bends of channels, forming new and more advantageous heads to river channels, &c. We have already said that, in former times, when tank repairs were chiefly in the hands of the Tahsildar, all such improvements were neglected, and the work done was

for

for the most part confined to heaping earth on tank banks, or digging it out of channels, without much regard to its disposal in the former case, or to the judicious excavation in the latter, and attention being very rarely given, by the best-intentioned Tahsildar, to any improvement. The Tahsildars are little different in character now from what they were formerly; the revenue and police work required of them is much more than it was then, and they have no more assistance; and such being the case, we can anticipate nothing from the operation of the proposed rule but a return to the old system.

The supposed check by the Collector would be physically impossible.

102. The Government anticipate that the change in view would lead to the maintenance of a more efficient control by the Collector over the Talook servants; but we are quite at a loss to see how it could have this effect, as it would deprive the Collector of the very important information and co-operation of the Civil Engineer, while it would give him nothing in their room.

As to any personal and direct supervision that could be exercised by a Collector over the execution of work, it is evident that this must be extremely limited. While on a tour through his district, he would visit the works near his route, as he does at present; but the numerous and pressing duties, which oblige him to have a large establishment along with him, effectually prevent, and must prevent frequent and rapid tours. Again as to the Assistant Collectors, we fully recognise the importance of their being much employed in visiting Maramut works, but this too can only be within narrow limits. A Collector requires the services of his assistant, as the Board have pointed out, for revenue, police, and general duties, and cannot spare more than a portion of their time for Maramut. If Assistant Collectors are really to take any effectual part in inspecting Maramut works, there must be two more given to each district; and we cannot see anything but an evil in employing them to do work for which they have not been prepared by any previous training, and which could be done both much better and much more cheaply by Assistant Civil Engineers and Surveyors.

For the foregoing reasons, we strongly object to the proposed rule. We would deprecate it in the strongest terms, as a decidedly retrograde step, as inflicting a very heavy blow on the efficiency of the Maramut Department, and as tending to undo very much of the improvement that has been effected in it in the course of the last 30 years.

The fifth rule; fortnightly inspection of works by Asst. Collectors is impossible.

103. As respects the fifth rule, we think it advantageous to require periodical reports on the progress of important works; but the Board's remark seems sound, that such reports should not be in detail, except for works of the greatest magnitude.

With respect to the second part of this rule, which requires that all important works should be visited once a fortnight by an Assistant Collector, we must refer to our observations on the first and fourth rules. The extent of the districts, the distance of works from each other, and the other duties which a Collector must require of his assistant (for he has rarely more than one second assistant), make it impossible that this rule can be carried into effect at present; and as to increasing the number of Assistant Collectors in order to make it practicable, it would so obviously be much better to lay out the money in strengthening the Civil Engineer's Department, that we shall say nothing further on that point. It is undoubtedly very desirable to induce the junior civil servants in the Revenue Department to take an active interest in Maramut operations, and more especially in those connected with the works of irrigation, and to make themselves acquainted with the incidents and circumstances of such works. To that end, Collectors should require their assistants, even from their first joining their districts, to visit works in progress, and should encourage them to observe the uses of such works, and of their various parts. In every case also where an Assistant has a separate revenue charge, we think he ought also to have the immediate control of the Maramut within it, except in particular cases, and the Sub-collector ought always to have charge of the Maramut Department within his Talooks. We dwell on these particulars, both because we deem it highly important that officers of the Revenue Department should be awake to the vast importance of works of irrigation and communication to the prosperity of the country, and competent to form a general judgment as to the effect of a proposed improvement, and even to originate improvements; and also because they ought to be able, by a familiarity with details which no officer has time to acquire, except in the earlier periods of his career, to exercise a real and effective check over the proceedings of the subor-

dinates of the Public Work Department, as well his own as those of the Civil Engineer's Establishment; but though the object of the rule under notice is approvable, so far as it might conduce to this end, we must strongly object to the enactment of the rule in its present terms, for the reasons already given.

The great want of the Department is not "responsibility," but increase of strength.

104. Having thus stated our opinion on each of the rules severally, we will conclude with a few general observations. We fully admit that the present "system is defective," (Minutes of Consultation, para. 3,) but we believe the main defect of the department to be, not the impossibility of fixing responsibility (para. 10), but the want of sufficient officers. We think the Board of Revenue fully warranted in their statement, that officers of all grades are already under a strict and efficient responsibility for the due performance of their respective duties; but undoubtedly that responsibility is qualified by the fact, that officers of all grades have so many things to attend to, that the attention they can give to any one, and consequently their responsibility for any one, must be small. It is our firm conviction, however, that this is the best arrangement under present circumstances; far better than to concentrate professional care and responsibility on a few works, by withdrawing it entirely from the many, in the manner now proposed. The present division of duties is correct as far as it goes; the projection and inspection of works are vested in one department, and the execution of them in another. Under the rules now proposed by the Government, the projection, execution and inspection of works would be in the same department; viz. of works below *Rs.* 1,000 in that of the Tahsildar, and of those above that amount in that of the Civil Engineer. Effective and independent inspection would be wholly absent in both instances, but most emphatically in the former; and without such inspection, as the Board truly observe, responsibility would be but a name.

The proposed rules would diminish responsibility.

Not true that ill-considered plans are commonly sent up; and in whatever degree it is true, it is owing to want of officers.

105. Again it is objected, that under the present system, ill-considered plans are sent up by the Civil Engineer, and hastily adopted by the Board of Revenue, (Minutes of Consultation, para. 11), and that estimates are very frequently insufficient, (para. 8). Our examinations of the records of the Board as explained above (para. 21), have led us to the conviction that this is not the case by any means to the extent indicated by the general terms used; but it may be confidently asserted, that in whatever degree it is so, it arises almost solely from the same cause, viz. the paucity of officers; this insufficiency in the number of officers has long been acknowledged; but up to the present time it has always been thought better that works should be done in a manner short of perfection, than not done at all; and assuredly this is the correct view; for even limiting our regards to the narrow subject of revenue, we find that the direct profit to Government from the outlay incurred, has been on the whole very great. We fully admit, and we are anxious to bring home the conviction to others, that works have sometimes been expensively and injudiciously constructed from want of a sufficient quantity of scientific and skilled superintendence; and that some few works have been executed which have not been successful, and which probably would not have been undertaken if the projects could have been fully considered; but even with these admitted defects, and including these failures, the total result has been largely profitable; and such being the case, it is obviously the wiser course, until adequate additional strength is granted, to continue the present system, imperfect as it is, rather than to paralyze under the idea of improving it. It would plainly be most unwise and senseless to reject the 40 or 50 per cent. of direct annual profit, obtainable by outlay, even with existing means, because it is possible that by improved means, not now available, the first cost of the works might be reduced 5 or 10 per cent.

The whole tendency of the rules is to stop improvement.

106. For we would observe, lastly, that the whole tendency of the proposed rules is to stop improvement, as we have already remarked in noticing them in detail, and for this reason, if for no other, we would earnestly deprecate their adoption. The country is destitute of the means of transport, and vast sources of wealth flow to waste in our rivers; hence commerce languishes, and industry is depressed. This, then, is not a time to contract still more the too limited scale of our expenditure on such works; to restrict the utility even of the means of control already existing, by requiring increased minuteness of previous detail. The proper course, recommended by policy and fully justified by past experience, is to employ those means over the widest possible field, and to increase them as rapidly as possible.

Section III.

Review of the Condition and the Treatment of the Roads in former Times; and of the working of the Road Department.

The condition of the roads and means of transit when the country first came under the English rule.

107. In speaking of the works of irrigation, we observed that in the Provinces which now form the Madras Presidency, the East India Company acquired a vast property in tanks and channels, which only required to be kept in efficient repair. With regard to the communications of the country, the case was far otherwise. It cannot be said that there was any capital invested in the ancient roads; and canals, for the purpose of navigation, had no existence in the South of India. Throughout the whole Peninsula there was not one complete road of any length on which it would have answered to employ wheel-carriages; their use therefore was very limited, and the distant traffic of the country had no where the advantage of them. Trucks were used by those who collected stone for the dams and tank embankments; and in some localities the harvest was brought in by carts upon wheels either formed of solid pieces of timber, or cut from a single block of stone; these carts were drawn by several pairs of bullocks, and carried nearly a ton, but they were never used for distant journeys; even the main streets of many of the largest towns were not practicable for wheels; and where the most wealthy used light carriages, they rarely left the precincts of their village. The only "made roads" (if they deserve the name) were the mountain passes, which in the later wars were opened for the passage of artillery; but they had generally been destroyed by the monsoon rains, before the country came into the possession of the Company. The only proof of attention to the great roads was to be seen in the fine avenues of trees, which in some districts measured several hundred miles in length; but as the road-ways beneath them never had been properly formed or drained, and bridges had not been built, or care taken to keep the pathway practicable, they were roads no longer; but in most cases, from being worn down by former traffic, and washed by the rains of the monsoon, they had become the drain of all the country that they passed through, and were so much more rugged than the land on either side, that their only use was as a guide to travellers, who took a course as nearly parallel as the ground permitted.

The communication by water at the same period.

108. With such a want of roads, it might have been expected that water-carriage, wherever it was available, would have been turned to the best account; but such was not the case; little use was made of the rivers, and nothing seems ever to have been done to improve their navigation. In the heavy freshes, rafts of timber, and circular boats of wicker-work, covered with leather, were floated down some of the larger streams; but on very few of the rivers was any attempt ever made to take laden vessels up the stream. Still less use was made of the canals of irrigation, though many of them were well adapted for water-carriage during six or eight months of the year. The back-waters both of the eastern and western coast were turned to somewhat more account; but the boats in use upon them were canoes made from single trees, which from their narrowness and consequent deep draught of water, were very ill-suited to the shallow lakes they navigated. A considerable traffic was carried on by means of coasting craft, but that was expensive, slow and dangerous. On the Coromandel coast the dhonies were badly shaped for sailing, even when the wind was fair, and from their want of keel could never work to windward. In some respects the pattimar on the other side of the Peninsula had advantages, being well-built for speed, and having a better form of sail; but in both cases they were quite unfit to trust in such storms as the coasts are subject to. That the carriage was expensive to what it might have been, is to be accounted for by the indolent manner in which the vessels were worked; by the number of men necessary to manage their unwieldy sails, and the time lost by the necessity for waiting till the wind was fair. The cost was also greatly increased by the difficulty of shipping and landing goods; to facilitate which no attempt seems ever to have been made by any of the native rulers of the country.

Trade was also oppressed by vexatious taxation.

109. Such were the only means of carriage in the South of India under the Native Governments, and, as if traffic was not sufficiently impeded by existing difficulties, heavy transit duties, the pernicious moturpha tax, and port charges of a hundred kinds, all collected in the most vexatious way, were imposed on every article excepting grain; and that was only exempt probably because the Govern-

ment were the great dealers, as they received the revenue from the irrigated lands in kind. Under these circumstances, it is not to be wondered at that the trade of the Peninsula was at the lowest ebb, and there cannot be a doubt that in the cost of carriage from these various causes, is to be found the reason why so little attention was ever paid in the inland districts of Southern India, to the production of anything beyond the food and simple clothing required by its inhabitants.

Improvement since that time, as shown by the more general use of carts.

110. That a great change for the better has taken place in the communications of the country between that time and this cannot be denied, for bad as the roads are at present, wheel carriages can be profitably worked in a great portion of the Presidency; and the comfort of the people has been greatly increased by their use, even in places which have not got the advantage of extended lines of road leading to distant markets. The introduction of the European form of wheel has, it is true, led to the employment of cattle in draught, where little or nothing has been done for the roads; but the extensive use now made of the common cart (or "bullock bandy)" for the traffic between the inland districts and the coasts, is only to be accounted for by the improved condition of many hundred miles of road. From the returns sent in by the Collectors of districts in 1848, it appears that there were at that time about 90,000 bandies in use in the Presidency; and as this census, like all others, was supposed by the inhabitants to have been taken with a view to some additional tax being imposed, it is probably much too low. Still, however, much of the produce of the country can only be transported to the coast, or even to the markets of the district in which it is grown, upon bullocks; and in many places the roads are yet impassable for laden cattle, and men carry the goods from place to place.

The river navigation has not been improved.

111. The river navigation of the country has not been improved, and canals for traffic have only been attempted on the very smallest scale. It can hardly be said that anything has yet been done to facilitate the landing and shipping of goods; and even in the Port of Madras the trade is still dependent on the Masula boat, without which a communication could not be kept up between the anchorage and the shore. One or two slight efforts have been made to improve the entrance of the smaller rivers, and with satisfactory results; but nothing has yet been attempted to turn the larger rivers to account to shelter shipping. A very great boon has, however, been conferred on the coasting trade, by the number of good lights kept on both sides of the Peninsula; and the clearing of the Paumbum passage has had a most beneficial effect on the traffic of the eastern and southern ports; leading, as is stated by the Marine Board, to the use of a better class of vessel for the navigation of the Gulf of Manaur, and increasing greatly the trade between Ceylon and the Continent. Many fine vessels vessels built in Calcutta, Bombay, Moulmein, Cochin and Coringa, are now engaged in the trade upon the eastern coast; but the native dhony is still much used, and the pattimar is yet almost exclusively in use upon the western side of the Peninsula.

In the early times of the British Government the roads were wholly neglected.

112. We now proceed to trace briefly the operations on the roads under the British Government, as well as the records which we have searched enable us to do it. We have said that some few mountain passes were open in the later times of the native governments for the passage of artillery and troops; but after the military movements ended they were no longer kept in order, and soon became so rugged that cattle could hardly climb them. Nor does it appear that our Government in those times showed much more wisdom than former Governments, as to the treatment of the roads and passes of the country. Those which were opened by our armies were neglected from the day that they were made; and the lines which were essential to the security of conquered territories, were only kept open by constant re-construction; no effort seems to have been made to prevent their ruin, or by timely repair to lessen the cost of keeping them fit for use. The traffic of the country profited in some degree by these military lines, and we can even now trace in most of our great trunk roads, as they are called, the lines used for connecting the military arsenals and cantonments. New roads for this purpose were opened in the time of peace, and on some of the mountain passes a great amount of labour was expended; still nothing was done to keep up the roads when opened, and little inquiry was made, how far the lines selected for improvement would beneficially affect the traffic of the country.

The bad state of the roads in 1813, as

113. The necessity for commercial roads was not, however, altogether overlooked either by the local Government or the Honourable Court; for we find a despatch

despatch upon the subject, dated 3d September 1817, and written in answer to a letter from the Board of Revenue to Government, bearing date 9th November 1813, from which it appears that the subject of internal communications had then been for some time under investigation. As the general tenor of this despatch seems in a great measure to have regulated the conduct of the local Government for many years, we give it here, together with several extracts from the letter to which it forms an answer. To begin with the latter, the Board of Revenue had been desired by the Government to call on all Collectors of districts for information regarding their roads, and from the reports received they wrote as follows: "Except a few of the principal roads in the Zillah of Chingleput, and the military road that leads through the Ceded Districts, it does not appear that any of the roads in these territories have ever been repaired at the expense of Government: even the military roads in the Ceded Districts are described to be now in some places very bad indeed, and the Ghauts at Balpullee, and between Wimtemullah and Cuddapah, though not impassable for artillery carriages, to be yet so very stony and difficult, as almost to destroy every conveyance of that sort which is brought through them. The Board have every reason to believe that the other roads which have been made or repaired at the expense of Government are also fast approaching to decay: indeed, those which have been framed merely by digging ditches, and raising the earth in the centre, are not perhaps so good as the old beaten track; for a raised road, not jellied (gravelled), is little better than a swamp after the rains. There scarcely exist any bridges in the interior of the country, and though ferries are established at the most frequented passages over the principal rivers, they are not under any systematic management; at some places they are rented out, at others they are kept up at the expense of Government: and, in some cases, a considerable surplus revenue is derived from them. In Bellary the net revenue from this source is about 1,500 pagodas; in Canara about 500 pagodas, and in Malabar about 1,000 pagodas per annum; and at many stations the ferries are kept up by boatmen on their own account."

described by the Board of Revenue.

"The importance of an easy and secure communication by land, in a political point of view, as well as to the commerce, the revenue, and the general prosperity of the country, is sufficiently obvious; but to create and maintain good roads throughout these territories, would involve the disbursement of a large portion of the revenue of Government, and, considering the existing state of inland commerce, would perhaps be as unnecessary as it would prove expensive."

114. The Board go on to point out that the roads of the Northern Circars are particularly bad; that it would be well to widen them where they pass through jungle, and to establish ferries; and they observe that the "jungle being entire," the expenditure on that account would be very heavy. In the 12th para. it is said, that with reference to the finances of Government it is not practicable to make roads through the country; so that, before anything is done, it would be well to determine the nature of the repairs that ought to be made. It is suggested, therefore, that where the jungle is too close the roads should be widened by its removal; that the banks of rivers should be sloped; that "passes should be cleared so as to admit of the safe passage of wheel carriages;" that better ferries should be established, and that they should be kept up by tolls; that the surplus money so raised should be spent on bridges, roads and causeways; and that the convicts should not confine their labour to the Zillah stations after their improvements were completed.

The trifling measures recommended by the Board for their improvement.

In thus summing up their recommendations for the management of the roads, the only tangible means applied for by the Board were the surplus ferry funds, amounting to less (in fact considerably less) than *Rs.* 35,000 a year, and the convict labour after the improvement of the Zillah stations was completed; the latter amounted to nothing, since the convicts could not do more than put the Zillah stations in order, and keep up the roads in the vicinity. Indeed, they have never yet effected this, for it cannot be said that any of them (except perhaps Madura, which has had a liberal sum of money spent upon it) are, to this day, either sufficiently drained, or have had their "improvements completed," in any sense of the words.

115. The Honourable Court's reply to this letter contained all that could have been expected, indeed, all that was asked for; sanction was given for the expenditure of the surplus ferry funds on road-making, and the convicts were to be employed

Reply of the Court of Directors.

employed on the roads when they could be spared. In answer to the general suggestions of the Board general instructions were returned; and the Court, misled by the exaggerated account given of the impediments met with in making roads, concurred in the opinion that the "finances are obviously inadequate, did not the nature of the soil and seasons oppose insurmountable obstacles," to the formation and maintenance of artificial roads. When this correspondence ended, the country generally had no provision whatever, either for the improvement or the maintenance of its roads; and no other means of communication were suggested.

Subsequent systematic neglect of the roads.

For a long time after this, nothing was done by Government for the roads of the country. A few Collectors, who happened to take an interest in their roads, did something by the aid of the inhabitants to improve the communications of their districts, but it rarely happened that they met with co-operation from their neighbour Collectors; so that there does not appear to have been one line of road completed either from the centre of the continent to the coast, or between any two distant markets. And so completely did the local Government neglect this important subject, that even the surplus ferry funds were not applied to the purpose for which they had been granted by the Court of Directors, and they never have been so up to the present day.

The Pioneers.

116. With all this unwise economy, there was a continual waste of money, and a vast loss of labour, by the employment of the corps of Pioneers, without any aid from engineering skill, to make roads on the great military lines. When not on active military service, this corps had to be maintained like the rest of the army, and any work done by it was so much saved out of an unavoidable expenditure. The Pioneers mustered at that time about 2,000 strong, and were notoriously a hard-working, useful body of men, worth double the number of any other native troops, but little hampered by customs of caste, and ready for any employment that was given to them. Had this corps been worked under the instruction of professional officers, they would have earned for the country far more than they cost; but it was the false economy of that time, as it is indeed to the present day, to work with inefficient means. The Pioneers were officered from the regiments of the Line; by men who had not only no knowledge of engineering, but who did not affect to understand surveying or levelling, or even the use of a plan or section if they had it. And, as if in mockery of all reason, they were referred, in cases of unusual difficulty, to the Department of the Quartermaster-general, which, from its organization, has no more scientific knowledge than the Pioneers themselves, and which, being entirely wanting in all practical experience in road-making, was a shade more blind than those it had to lead.

The road from Masulipatam to Hydrabad.

117. To show how this system worked, we give an extract from Minutes of Consultation, dated 2d February 1831, passing final orders on the results of an attempt to open a military road from Masulipatam to Hydrabad: "In December 1822, the Commander-in-Chief, in a letter from the Quartermaster-general, suggested the employment of the head-quarters and three companies of Pioneers on this work (the road from Hydrabad to Masulipatam), and stated that he was not aware that the Pioneers would require more assistance than a few carts, for the purpose of making the road in those places where the natural soil might require to be amended. The Government, on the 24th of the same month, approved the arrangement proposed by his Excellency for repairing the road from Secunderabad to Masulipatam, and granted authority for indenting on the Commissariat for the number of carts required." On the 16th of May 1823, the Commander-in-Chief submitted that it would take the three companies of Pioneers six years to complete the road, and stated the number of tank-diggers, artificers, carts, &c., which would be required in aid of the Pioneers, to effect the same object in three years. The Government then called for an estimate, and one was furnished by the Deputy Quartermaster-general of the Hydrabad force, amounting to *Rs.* 1,70,568 for the whole distance, viz. 222 miles; the portion through the Company's territories, 126 miles, requiring "little less than a lac." The Resident was ordered to apply to the Nizam for what was required through his territories, and the Revenue Board was directed to supply means for the remainder. The Minute goes on to say, "Instead, however, of the road having been completed in 1826, at a cost of 1,53,664 Madras rupees, the Right honourable the Governor in Council regrets to find that only 176 miles of road have as yet been made, and that the enormous sum of *Rs.* 8,43,347. 9. 9. had been expended on this work prior to the 30th June last."

"It is accordingly resolved that all the carts, coolies and extra artificers attached to

to the party of Pioneers employed on the Hydrabad road be immediately discharged; and that the duty of the Pioneers be hereafter confined to the repair of such parts of the road as may be now impassable for wheel carriages."

The erroneous and wasteful course adopted by Government.

118. In this case, the Government had begun in the hope that the Pioneer corps, with some little pecuniary aid, would open the road, and found itself betrayed into a heavy expenditure with most inadequate results. But that the error in policy was still overlooked, is clear from the 3d para. of the same Minute, in which the Government consoles itself by the reflection that the rest of the Pioneers (eight companies) were very judiciously employed in opening the passes of Neilgherries and the Western Ghauts, " where the work can only be done by scientific men, inured to hardships; and, moreover, as they have no hired carts or extra establishments attached to them, the expense of the work performed by these companies is confined to their pay and allowances." The Pioneers, who were totally without any pretensions to science, and who had utterly failed in the open plains, were thus, by some strange process of reasoning, supposed, as " scientific men," to be well qualified to open the intricate communications on the western side of the Peninsula, where it was confidently hoped that they could have no aid of any kind. While on the continent of Europe the ablest Engineers were sought for to open the mountain passes, and every available means was placed at their disposal, it was considered politic to do the work in India at any loss of labour, so that no money-payment appeared in the accounts. The result, of course, was, that wrong lines for the trade were chosen, and the passes were made just too steep for wheels; a vast amount of toil, as well as time, was spent on rocks which would have been avoided had the use of the levelling instrument been understood; months were thrown away working with cheap and inefficient tools; and there is not one of the passes so made which has not either been already superseded, or which should not be abandoned for a better line. We may instance amongst their most laborious undertakings the Bizly, the Higgelah and the Periah Ghauts, all abandoned, except as local passes, for the Munjerabad, Sumpagee and Periambaddy respectively. There are also the Kotagherry, Conoor and Koondah passes, still impracticable for wheels; and others, both in Canara and Malabar, which might, if they were not buried in the jungle out of sight, be of more service now as monuments of Madras economy, than they ever were, or could be in any other way.

Government resolve in 1831 to abandon the idea of improving the roads of the country.

119. In the Minutes of Consultation above quoted, there is a clear exposition of the views then entertained by our local Government on the subject of roads. The Hyderabad and Masulipatam road had cost a large sum of money, and there was more required; so without any good means of knowing what the road was worth to the country, what it would cost to complete it, what ought to be done to preserve the portion finished, or by what other means more satisfactory results on all points might be attained, it is determined to cut off all further supplies, and leave the Pioneers to keep the communication open as they best could.

The Minute further states, that " a full consideration of the difficulties opposed to the maintenance of good roads in other places than the immediate vicinity of large towns, has satisfied the Government that the attempt should not be persisted in. At Madras, a very considerable portion of the expense incurred in the formation and repair of roads is defrayed from the Assessment Fund, and at large stations in the provinces the work is mostly performed by convicts; and repairs being undertaken directly the slightest failure is observed, large disbursements on that account are avoided. In large military roads" (all great roads are here intended), " through long tracts of thinly-inhabited districts, the case is evidently different; the whole cost of the work falls on the Government; and from there being no means at hand to repair damages so soon as sustained, large portions of the raised roads through the low countries, in which the Carnatic and other provinces subject to the Government abound, must be carried away by every monsoon, or be so injured as to make their repair almost as expensive as their original formation.

" These and other reasons have satisfied the Governor in Council that the attention of the Government in this respect may now be safely and beneficially limited to the maintenance of communication between different stations for the common wheeled carriages of the country, and that this object can be best and most economically effected, as it now is, by the Collectors of Districts, except in special cases, which will be open to the particular consideration of Government."

Thus, then, it was again resolved in 1831, that no further attempt was to be made to keep up great lines of road through the country; the Collectors were to

do what they could each in their own district, and the Pioneers were to work without any pecuniary aid from Government.

The Pioneers converted into Sappers and Miners.

120. In the course of the same year, 1831, it was determined that the corps of Pioneers should be re-organized under the name of "Sappers and Miners," and officered by Engineers. This was a move in the right direction; but as nothing at that time was done without retrenchment, the corps was reduced to one battalion of six companies. There seemed no good reason for reducing this regiment, instead of one or even two regiments of the line, which in the time of peace, at all events, were of far less value to the country. For some years the head-quarters of the Sappers were fixed at Bangalore, and they had parties on some roads chiefly in the Mysore country, but their work in that way was limited. About 1843 they were transferred to Mercara, and since that time they have not been employed on the roads at all. Though nominally officered by Engineers, yet from the extreme paucity of the officers of that corps, and the urgent call for them for other duties, there have rarely been more than two with the Sappers, a Commandant and an Adjutant, the other officers being from the line.

The roads of the Salem district.

121. About this time, viz. between 1829 and 1837, several of the roads of the Salem district were put into good order under the management of the Collector (Mr. Orr), at a cost of only *Rs.* 41,000 of Government money, by far the greater part of the work having been done by unpaid labour, called voluntary. That country was peculiarly favourable for road-making; there were no great rivers to be bridged, or plains of alluvium to be crossed, the soil in general was well adapted for the surface of a road, and there was nothing to prevent a choice of lines. Mr. Orr probably obtained more aid from the people than they could well afford to give, or than was quite justifiable after the receipt of the Court's despatch above quoted, where, in their 65th para., they wisely express their "serious doubts of the expediency of adopting any measure which would augment the pressure of the landed assessment on the agricultural resources of the country." The effect on the district, however, was very good; and as a light contribution was raised from the carts to form a fund towards keeping the roads in order, and the system of unpaid labour has been continued for the same object, the communications of that part of the country have been since then in somewhat better condition than those of any other collectorate. As a proof, however, of the ill effect of road-making without a general plan of operation, we may state that, up to the present time, the main line through the centre of the Salem district has not been completed, either to the eastern or western coast. Through Coimbatore, some of the greatest impediments have very recently been removed by the clearing of the Walliar jungle; but from the frontier of Salem, through South Arcot to Cuddalore (the natural seaport of the former district), the road is still one of the very worst in the Carnatic. With all that has been done, both by the Government and the people, the principal part of Salem has no tolerable direct outlet for its produce; and there being no considerable military station within it, or any very great trading town, much of the advantage that ought to have been derived from its own good roads has been lost.

The want of a general plan.

Cattle railroad proposed by Captain A. Cotton in 1836.

122. In the period under review, the improvement of the main communications of the country was once more discussed, and Captain (now Lieut.-Colonel) A. T. Cotton was called upon for his opinion on the subject; his report was written in May 1836, and was ordered to be lithographed, in the hope that it would be the groundwork of something more detailed. Captain Cotton suggested a system of cheap railroads, worked by cattle, on those lines where water-carriage could not be had. He pointed out the great advantage to be derived from one general scheme, drawn up and acted upon by the Government, as a security against the waste that results from contending interests, when individuals or companies are each working to benefit themselves without a fixed plan of action.

Captain Cotton, after going very fully into the grounds on which he formed his opinion, wrote as follows: "Upon the whole, I am myself so satisfied with the prospect which the construction of railroads holds out, that, in my opinion, it would be most advisable, before another rupee is expended on the common roads in India, to sketch out a general plan for 5,000 miles of railroad, open a loan for from one to two crore of rupees, and form a regular department for carrying out all the details of the work, commencing, of course, with one or two lines, and proceeding as the results afforded encouragement; and it appears to me that, to do this,

this, nothing is necessary but the determination of the Government, as no money would be required from the Treasury, and the Government are in a situation now to carry communications wherever they please. Were this sum of money required for carrying on a war, it would no doubt be instantly procured, though it would leave a permanent burthen upon the Treasury."

His recommendation regarding the communications parallel to both coasts was, that the back-waters should be united by canals; by which he calculated that goods could be moved at the rate of 3 or 4 pice per ton per mile, and that at a cost of *Rs.* 7,80,000 about 600 miles of inland navigation could be completed, of vast importance in all respects, especially in its effect of equalizing the price of grain in times of scarcity.

Captain Cotton suggested that the first line laid down should be from Madras to the westward as far as Wallajahnuggur, 70 miles; and that no time should be lost in investigating the whole proposal in more detail.

A small experimental line laid down near Madras.

123. His suggestions contained in that report were too comprehensive to suit the times; and as there appeared little chance of anything on a large scale being done, he proposed to show the effect of a cattle railroad in bringing to Madras the material used for the roads and streets of the town and its suburbs. This project was sanctioned, and the work executed, but Captain Cotton had reduced his estimate of the cost of the work too low, and had calculated too little loss from loading and unloading; and much of the profit anticipated from the rail was consumed by the use of a canal for some portion of the distance. After this work had been in operation a short time, it was found that the rails would not bear the traffic, and that altogether the work was not answering the expectations of the projector; a committee was therefore appointed to inquire into the state of affairs, in order that the work might be rendered more efficient, or abandoned. The result of this inquiry was a recommendation that the work should be given up, and the rails removed; the committee's opinion to this effect being expressed in an extract from their report, given below.*

Its results.

The effect of the railroad had been to reduce considerably the cost of carriage by

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* Extract from the 2d Report of the Committee upon the Red Hill Railroad, dated 2d February 1839.

92. "The Committee have before stated (in para. 56 of their Report) that the project of the railway was one which at its first commencement had every reasonable prospect of success. Nor at the time that it was undertaken, was there the least cause to believe that any circumstances could arise whereby the Government could be deprived of the profits which might fairly have been expected from it.

93. "At that time Government, who were to be the sole proprietors of the undertaking, were also to be the sole parties benefited by it, they being almost the sole consumers of the article whose cost was to be reduced. As long as this position of things continued, the injurious effects of a competition would, it is plain, offer no just argument against the soundness of the speculation, or the reality of the profits effected by it. It would be quite satisfactory, for instance, were the Government assured, that whereas before the establishment of a railroad they had been compelled to purchase annually 1,00,000 loads of jelly at a cost of 8 ¾ annas per load, they now procured the same at a diminished cost of only 6 annas; although other parties benefiting by the competition established at their expense, should actually succeed in purchasing the same at 5 annas.

94. "But long since the commencement, indeed before the completion of the railroad, the Government have unfortunately ceased to be the sole consumers of the material which it is the object of the railroad to supply, and the transfer of the charge of the public roads into municipal management has changed the character of this establishment, which, instead of continuing what it was originally contemplated to be, a means of certainly diminishing a large unavoidable outlay, has now been compelled to take its chance as a speculation for supplying others, into whose pockets now passes the saving effected by the competition, and the reduction of prices, brought about most probably at the expense of Government.

95. "That the railway, after reducing the prices of transport to the lowest possible charge, should be able to compete with these reduced charges, and show the same profits as the original scheme contemplated, is of course not to be expected; yet at the same time it cannot be denied, that without this it will be vain to look for any remunerative profit in the new position in which it now stands; the great advantages which the railway fairly promised to the consumers of material being now lost to Government, except in a very partial proportion.

96. "It is, indeed, not unreasonable to say that a considerable saving is now being effected by the existence of this undertaking, which, in the reduced prices effected by it, must certainly in some degree have contributed to the lessening the annual outlay upon repairs of public roads, though its share in this reduction cannot perhaps be exactly estimated, or its value ascertained. It is important, however, to recollect that this by no means insignificant saving has been and still continues to be felt; though, unless some means can be devised for directing it into its proper channel, the benefit, as a return for the capital expended, must be for ever lost; and the Government, by the further prosecution of the project, might be altogether disappointed of the profits realised, by not being sensible that they were being reaped by others."

by the common bandy (by the owners entering into competition); and had the Government kept under its own management the whole of the roads and streets as they had hitherto done, the saving by this alone would probably, in spite of its extra cost, have paid a fair interest for the money sacrificed: but as arrangements were made just at that time for placing a greater part of the roads under municipal management, the Government, which was to bear the whole expense of the rail-road, and all the works connected with it, had comparatively little interest in lowering the cost of road material.

And the causes of its failure.

The failure of this project put an end for the time to all hopes of further inquiry into the value of cattle railroads, for though nothing was proved, except that a line working in connexion with a canal, on so small a scale, and for a very limited purpose, had not, from various causes, yielded the profit expected, it afforded sufficient grounds for abandoning a scheme, at the time considered visionary, probably because it exceeded in extent the ordinary projects of improvement submitted for the consideration of the Madras Government.

Two important lines of road opened.

124. In the course of the years 1837 to 1843 some important lines of road were opened or improved; but there was a want of system in the management of the several undertakings which led to a considerable unnecessary expenditure. Two of the most important works were the making a road on the line from Madras to the northern limits of the Salem District, in the direction of Bangalore (since called the Western Trunk Road), and opening a line of road from the western boundary of Mysore, through Coorg to Mangalore. The object of the former was to facilitate traffic, and the movements of troops and stores, between Madras and Bangalore, and the stations on the western coast: the latter was to enable troops and artillery to move with ease through some Talooks of Canara, which had lately been in revolt against the Government.

On the Madras and Bangalore road a large body of convicts were employed, and no expense was spared to facilitate the work, which, when the establishment was broken up in October 1844, had cost 10½ lacks of rupees. There were some essential faults in the line chosen, and the result of the expenditure was not considered satisfactory; but still the formation of the road was a vast benefit, as we shall presently have to state more in detail; and it must be remembered, that the large sum which we have named covered not only the original cost of the road, but its maintenance for four years against a very heavy traffic.

The Sumpajee line to Mangalore, which was traced by a young officer of Engineers, and carried on under many different executive officers, was completed with perfect success, though the sum spent upon it was greater than had been anticipated, and probably greater than would have been expended if more accurate previous inquiries had been made, and if the work had been completed under the management of one experienced officer. There was, however, no great cause for complaint, seeing that a magnificent carriage-road was opened for a distance of 70 miles through a most difficult country, including a pass of 2,500 feet in height, at a cost of less than *Rs.* 4,000 a mile. The Sumpajee Ghaut was the first of the Great Western passes opened on an easy slope for wheel-carriages; and it is a noble monument of the genius of the late Lieutenant Fast, who died two years after his work on the Sumpajee ended, while carrying out a similar undertaking in the Coimbatore District, even then only 25 years of age.

The Road Department constituted in 1845.

125. In the 20 years from 1826 to 1845, the average yearly outlay on the communications of the whole Presidency of Madras, 1,38,249 square miles in extent, had been *Rs.* 1,16,926, or £. 11,693 sterling (*see* Appendix (W.). The expenditure had been more liberal in the later half of the term than in the earlier; the yearly average of the first 10 years being *Rs.* 84,503, and that of the second *Rs.* 1,79,348. A very large part of this increased outlay was absorbed by the high Western Road, and the Sumpajee Ghaut and road also contributed to swell the average. With the year 1846 a new era commenced in the history of the roads of the country, and the operations and the expenditure became somewhat larger.

Up to the year 1845 the whole of the expenditure on roads was under the control of the Board of Revenue; but the Marquis of Tweeddale, being dissatisfied with the working of the system as we have been describing it, and feeling the necessity of a more efficient agency for improving the means of transit, resolved in that year to constitute a separate department for the purpose, to be under a "Superintendent of Roads," and with a fixed annual sum set apart for it. Pending a reference

a reference to the Honourable Court of Directors, Captain Best of the Engineers was provisionally appointed Superintendent on the 21st April 1845; the object of the appointment was declared (extract Minutes of Consultation, 12 April 1845) to be exclusively the repair and preservation of existing roads; and it was expressly prescribed that the Superintendent should not be engaged in laying out new roads, In pursuance of instructions, not very precise, Captain Best took charge of the two newly formed lines specified in the last paragraph, and adopted measures for their maintenance; and he also examined the country between Madras and Trichinopoly, with the view of determining the best line for a new road.

Its formation approved by the Court of Directors.

126. The Court of Directors approved of the nomination of an officer for the special charge of the main or trunk roads; and they also acceded to the proposal of the Government, that four lacs of rupees should be annually devoted to their formation, maintenance and repair. And on the 27th January 1846, the Government gave effect to this sanction of the Honourable Court in an order, of which the chief points are embodied in the following abstract:—

The order of Government, respecting the trunk roads.

It relieved the Board of Revenue from the supervision of the great lines and trunk roads, and placed, permanently, under Captain Best, the four lines noted at foot,* being a total length of nearly 1,300 miles, together with the comprehensive but somewhat indefinite addition of "all extensive lines of road;" the branch roads and minor district roads being still left under the Collectors and Civil Engineers. It gave Captain Best an assistant, and directed him to state the office establishment that would be required; he was also (para. 21) to give his particular attention to the subject of the employment of European Overseers, and to report the arrangements that he would propose for that object.

It provided that the outlay on the trunk roads should never exceed four lacs annually, including all charges of every description connected with them, and all estimates already sanctioned for works upon them; but it added that expenditure on the minor roads should not be provided out of this four lacs.

It stated, that as the four lacs had been placed at the exclusive disposal of the Madras Government, estimates for works under it would be passed without reference to the Government of India; but that those for opening new lines, if greatly exceeding *Rs.* 10,000, would be submitted for the sanction of the Court of Directors.

The Superintendent was to correspond directly with Government; he was to report on each five miles of road finished; and a general report of the transactions in the department in each year was to be submitted after its close.

And the branch roads.

127. The same order also contained some directions intended for the better management of the district or cross roads, of which we will also give the purport here.

It was ordered that both the Collectors and the Civil Engineers should report to the Board of Revenue in the Department of Public Works on the state of the roads of that class within their respective districts and divisions; the former officers stating the actual advantages gained by past improvements, and suggesting new; the latter reporting the condition of the roads, with a view to their timely repair.

The Collectors were also authorised to disburse money for the repair of made roads of this class, on the responsibility of the Civil Engineer for the necessity of the outlay, to an amount not exceeding *Rs.* 50 a mile annually; but this permission never reached the local officers, for the Board of Revenue wholly omitted to communicate it to them, and it has, therefore, never been put in operation.

In order to ensure uniformity of system in the management of the trunk roads and of the branch roads, it was directed that the Superintendent of Roads should be "consulted in the formation, the keeping in repair, and the improvement of the branch roads, and whenever the public money is expended on roads;" and in order that "Government might have before it in one statement a clear view of the total annual outlay on roads," it was directed that the Superintendent should, in communication

* 1. The Western Road to the Mysore frontier, about - - - - - - 200 miles.
2. The Southern Road to Trichonopoly, about - - - - - - - 205 „
3. The Northern Road, with the branch to Cuddapah - - - - - - 785 „
4. The Sumpajee Ghaut Road, from the Mysore country through Coorg to Mangalore 105 „

TOTAL - - - 1,295 miles.

munication with the Board of Revenue, forward to Government statements to be submitted by the local officers; and the Board, as well as the Collectors and Civil Engineers, were ordered to furnish the Superintendent with "whatever information, Reports, &c. connected with roads," he might require. So also the Superintendent was to furnish the Board with whatever statements and information might be necessary to enable them to complete their annual reports of expenditure in the Maramut and Civil Buildings Department.

The Assistants to the Superintendent.

128. The office of Assistant to the Superintendent was conferred on Lieutenant James Johnstone of the Engineers, but ill-health obliged that officer to leave India six months afterwards, and no Engineer has since been appointed. Thus the engineering labours of the Superintendent were at once doubled. Two Assistants were subsequently nominated from the Line, in place of the single Professional Assistant; but though very valuable in the active and efficient execution of work, they were and are unable to relieve the Superintendent of any part of his engineering work; and the Government have recently pronounced it unfit that they should be left any considerable time without his personal direction, even in the management of works in progress.

The instructions to the Superintendent.

129. Captain Best was placed in direct communication with Government, under the supposition that he would thus be able to act with more freedom, and consequently with more vigour, than if placed under the intermediate authority of the Revenue Board. The instructions by which he was to be guided are conveyed in the order of Government of which we have given the purport. But referring as they do to four previous and somewhat conflicting orders, they fail to convey to us a clear idea of the intentions of Government on some material points.

One of the papers to which Captain Best is there referred, is an extract from the Minutes of Consultation, dated 12th April 1845, which expressly declared the object of his appointment to be "exclusively the repair and preservation of existing roads, constructed at a heavy outlay." It gave him authority to make such minor improvements as might be necessary, but clearly declared that he was "not to be engaged in laying out new roads, or in examining new lines." And it was added, "The object of his appointment is limited to the keeping the roads already made in perfect order, and to superintending, therefore, in person, the execution of those timely repairs which all formed roads in this country so especially need."

He was to be executive as well as superintending.

The order last quoted implies that the Superintendent was to consider himself as charged with the execution in the most minute detail. And we find that Captain Best, who was at that time in constant personal communication with the Governor on the subject of his new office, and who, as it appears from the minutes of the President above quoted, made many suggestions himself as to the mode of organizing the Road Department, considered himself in executive charge of the works in progress.

His duties as then prescribed.

130. The duties, therefore, as he considered them, were apparently as follows: He had personal and executive charge of four lines of road diverging from Madras; viz. southward, to Trichinopoly; westward, to Bangalore and Mangalore; and northward, to the frontier of the Bengal territory, with a branch inland to Cuddapah, in all 1,300 miles in length; and as the lines radiated from a point on the coast, they were most unfavourably situated for frequent inspection. With the aid of one Engineer Assistant he was required partly to create a new, and partly to restore from a state of total ruin this great extent of road, and to report upon each five miles that were completed, after personal superintendence of the work; and having drawn all the money required in his own name, and laid it out in works under his own immediate direction and control, he was to check his own accounts, and forward the bills direct to the Government for sanction. He was also to give instructions to the Public Works Department of the Board of Revenue as to the management of all the cross or minor roads of the country; and to be consulting Engineer to the Board in all cases regarding the repair or improvement of those roads. At the end of each year, his expenditure was to be made known to the Board, who were in like manner to keep him informed of all sums spent upon the cross-roads and works connected with them. And in addition to the report upon each completed space of five miles, he was to send in annually a general report upon the trunk roads.

The Department has failed.

131. It is hardly necessary to say that the incongruities here described led to the total failure of the Road Department for the purpose for which it was organized. The report upon small spaces of roadway completed was never attempted, because

because practically impossible; and a monthly report of the proceedings of the department was substituted, in which inspections of work executed were recorded, but in many cases not till years after the accounts had been closed. The position in which the Superintendent was placed in his communications with the Board of Revenue having been objected to by the latter, and the Court of Directors agreeing with them, that it was not a suitable arrangement, no inter-communication ever took place between the two offices. Captain Best indeed forwarded to the Board a set of rules for the classification and management of the roads of the country left under the Board's control; but though those rules were circulated to the Collectors and Civil Engineers, it was without any expression of the Board's opinion, or any order whatever, and consequently they have been entirely inoperative. There was no interchange of information between the two departments as to the annual expenditure in each, and the Board have never, in any instance, applied to the Superintendent for information or advice as to any roads.

And as to the work of the Road Department itself, the expenditure in the six years has only been 13 lacs instead of 24, and no small portion of that has been on works not contemplated when the grant was made. Only one line of road can yet be called complete, and that was almost equally complete before the department was formed. The greater part of the work on these roads is once more under the management of the Civil Engineer and Revenue Departments; with this change only from the system of former times, that the accounts are sent in direct to Government by the officer in whose name the money is drawn, without any examination by a controlling department, or any certain inspection of work or check on expenditure. With 12 lines of road now nominally under the Superintendent, measuring 2,288 miles, his movements have been restricted, by a late order of Government, to three lines near the Presidency, to the extent of only 390 miles, the remaining portion of what have been considered the most important roads of the country being only here and there under management of any sort. The general reports, which should have been sent in annually, have only been prepared twice in the six years. On the 1st of May last, the date to which the second report reaches, there were accounts unadjusted to the amount of *Rs.* 8,34,427. 7. 3; and the strength of the Road Department, which was to have extended its operations over the whole country, is not at all more than sufficient for the very small portion of road still under the personal control of the Superintendent himself.

Causes of the failure.

132. It must be admitted, that as a department for the management of the trunk roads of the Presidency, its failure has been complete; but we feel confident that we can show that the result may fully be accounted for by the impracticability of the original instructions, the restrictions since imposed, and the withholding of the necessary means and assistance from the late most zealous Superintendent, who can only be held responsible to the extent of having taken upon himself duties which, even if well supported, no one individual could have performed.

Captain Best took the charge upon himself without remonstrance. Indeed from the President's minute, it is evident that he was himself, in a great degree, the originator of the scheme. He did this with the hope that his own energy would carry him through all that was expected of him, and in the expectation that within the limits sanctioned by the Court, he would have the full support and confidence of the Government in disposing of the "Four Lac Fund." And had he been invested with such powers as to enable him to modify and improve his system as his experience suggested, it is possible that so great a change in it would gradually have taken place as would have made the department of real value to the country.

The state of the North road.

133. To show that the original instructions were impracticable, it is hardly necessary to do more than point to the length and condition of one of the four lines to be restored, or rather to be made. The northern road extended from Madras to the frontiers of Bengal, a distance of 676 miles, and the whole of it, with the exception of 103 miles, between Goomadapoondy and Ulloor, and 54 miles between Itchapoor and the boundaries of the Presidency was in utter ruin, and even the two excepted portions were in a very bad state. This line was to be entirely re-formed and bridged, and much of it even to be retraced. The country through which it passes is one in which there are the greatest impediments to road-making; the line lying across the whole drainage of the country, and running for a considerable

siderable distance through the low lands near the coast, subject to most destructive floods.

This alone would have occupied the department several years.

We do not hesitate to say that to have laid out this road only, bridged the streams, and brought it into good order, would have occupied Captain Best and his Engineer Assistant all the years that have elapsed since the department was formed. Indeed if such attention to detail were to have been given as was implied by the report, "after personal inspection of each five miles when executed," even that period would not nearly have sufficed to complete this one undertaking. The actual progress in the formation of the southern trunk road bears out this assertion, although it is now more than four years since the estimate was sanctioned, that road, 200 miles in length, is still hardly more than half finished, though the difficulties are very trifling in comparison with those of the northern road.

The branch road to Cuddapah entailed the trace of a new Ghaut, and much engineering skill, probably two years' work; and the great western road from Madras to Bangalore, having to be brought into order, and kept in that state against such a traffic as no other road in the country had been subjected to, would have afforded ample occupation for the most active engineer.

Captain Best's scheme of an establishment refused by Government.

134. On the 4th of March 1846, Captain Best brought before Government his scheme for forming a Subordinate Department, at a cost of *Rs.* 1,390 monthly; it included teachers for the Maistries and others, and was such as he considered would be sufficient when the expenditure amounted to four lacs annually. This establishment was objected to; the Government considered it "inexpedient to sanction so large an establishment as that proposed by the Superintendent of Trunk Roads in the foregoing letter;" and added the following expression of their sentiments:—"Independently of the heavy charges it would create, a large establishment of this nature is open to exception, as tending to take the Superintendent from his more direct and immediate duties, the constant personal supervision of the works under his care, and to constitute him rather the head of a fixed office establishment, when he would be occupied in superintending the routine office duties of an establishment. This would not meet the views of Government, as it is the object of his Lordship in Council to keep the Road Department a practical working department, rendered efficient by undertaking no more at one period than can be readily and thoroughly superintended, and by securing for all works the constant personal supervision of the European heads of the department; and he is of opinion, therefore, that the establishment should be such as can move without difficulty with the Superintendent."

"Under this view, his Lordship in Council desires that an amended list of establishment be submitted, approximating as closely as possible to the working establishment entertained for the Civil Engineers of a division and their assistants, with one or two extra Writers and a Calculator, and that the salaries proposed be regulated with referenee to those drawn by servants attached to the Divisional Engineers.

"These observations are not intended to apply to that portion of the establishment recommended by the Superintendent for the execution of works, as Maistries, and Overseers and their assistants, taken from the Sappers. These should be proposed as the works progress, and a list of those actually required at this date, with the salaries now recommended for each, should be submitted with the amended list of the Government establishment called for, and the particular duties on which they are employed should be stated."

This refusal destroyed all hope of an efficient department.

135. The rejection of this proposal put an end at once to all prospect of an efficient department; it was to be formed on the model of the Civil Engineer's establishments, which were notoriously inefficient for the duties they had to perform; but worse than that, the executive portion being only sufficient for the work required from day to day, there was no material for extending it. It may be that the Superintendent would not have been able, by means of the establishment he applied for, to supply the trunk roads with a good executive force in any moderate number of years; but had there been a system of education in progress from that time, it is more than probable that there would have been ere this a certain number of good road-makers to carry the result of the Superintendents' experience over the country, for the instruction of the Revenue executive, who to this day know no more of the art of making roads than they did before the Road Department was formed. Even that department, with its limited sphere of operation, was crippled by

by the want of instructed agents; and to correct this we find that in 1848 the Superintendent was allowed to entertain six apprentices at *Rs.* 7 a month each; but no instructors were provided, and the education of these lads seems to have cost much of the Superintendent's own time, which could ill be spared for such a purpose; while, from the smallness of the number, nothing important to the country in general could or did result, except the fact being established by experiment, that native youths would make useful subordinates in the Road Department, if properly instructed.

It was soon found necessary to give the Superintendent the aid of the Civil Engineers.

136. If the Road Department, as at first arranged, was unable to realise the anticipations of Government, it was still less likely to do so when one of the two Engineer Officers was withdrawn from it, and the original extent of road (1,300 miles) had been increased to 12 lines, measuring 2,288 miles. This extension of work, with reduced means, led, as might have been expected, to a rapid development of the errors of the system; and even so early as the 10th August 1847, the Government was obliged to give the Superintendent the occasional aid of the Civil Engineers, though one object of the formation of a separate department for the trunk roads was to relieve those officers, who were acknowledged to be overworked. Captain Best says, in his Report of May 1848, para. 19, "Some portion of the roads, in accordance with this decision, will be constructed under the immediate supervision of the Superintendent of Roads and his assistants, the remainder under that of Civil Engineers of divisions, corresponding on the subject of trunk roads with the Superintendent of Roads, as they do with the Board of Revenue in the Department of Public Works, regarding branch and minor roads and works of irrigation."

From that time the department changed its character; it was executive on the roads near Madras, but not elsewhere; still, however, the Superintendent drew the money on his own receipt from the Collectors, though it remained in their treasuries to be actually paid out as required by the Civil Engineer or his assistants engaged in the executive. The accounts were rendered to Captain Best as the head of the department, and it was his duty to forward them for sanction when he had inspected the work.

Captain Best's first general report;

Loss of time and the causes of it.

137. In August 1848 Captain Best sent in his First General Report, reviewing the operations of the department up to the close of the year ending the 30th April of that year. The account which accompanied it, showed that in three years only *Rs.* 2,65,609. 14. had been expended out of the 12 lacs sanctioned by the Court. This was a grievous loss of time, but was fully to be accounted for by the very inadequate scale on which the department was formed. On almost every one of the lines of road under the nominal charge of the Superintendent, careful designs and traces were to be made before estimates could be prepared; and for such work the undivided attention of an Engineer was required, but could not be given. Even to effect the very limited expenditure above indicated, it was necessary to adopt projects and estimates which had been already sent up by the Civil Engineers; and several such projects having been approved by the Government, were adopted for execution by the Road Department, and the money for the purpose was supplied from the Four-lac Fund. In other cases the Superintendent considered it his duty to defer decision on projects sent up by the Civil Engineers, till he could personally inspect the locality himself. The Perumbuddy Ghaut was a case of the former kind, being entered upon without the inspection of the Superintendent; while the Walliaur and Coimbatore Road was, on the other hand, delayed three years till he could visit the spot; the fact being that Captain Best had determined to carry out to the utmost the instructions given him, to be personally engaged in all that was done, but was frequently obliged to receive extraneous assistance in spite of himself. We need not follow Captain Best in his Reports upon the several roads in 1848, as they are not in sufficient detail to afford the means of a comparison between the condition of the roads then and now.

Dissatisfaction of Government with the department.

138. During the years 1849 and 1850 the Government appear to have become increasingly dissatisfied with the working of the Road Department; and on the 31st of January 1851, they expressed an opinion to that effect in Minutes of Consultation, No. 48, in the following terms:—"In regard to the Road Department, also, some alteration of the system seems necessary. With every disposition to give full credit to Captain Best's zeal and exertions, the Governor in Council, adverting to the correspondence which took place in 1846, and particularly to that

officer's three memoranda of the 20th, 26th and 27th November 1845, which were laid before the Council Board by the late President, is forced to admit that nothing has yet been effected as to roads at all adequate to the expectations which were at that time formed, with reference to the Honourable Court's sanction for an annual outlay of four lacs of rupees.

" Whatever may have been the circumstances which have led to this result, it is useless now to discuss; but there is sufficient to show the necessity for a closer superintendence of all work, and to demonstrate that no large portion of any of the trunk roads on which workmen are engaged, should be for any period beyond a few days left without the personal supervision of the Superintendent of Roads, or one of his assistants.

" In pursuance of these views, the Government (under date 4th October 1850, No. 191,) desired Captain Best to confine his movements, and to give his best attention to the western and southern roads, and to the roads from Arcot and Vellore to Chittoor, and thence to the Mysore frontier, observing at the time that these works would amply occupy the time and attention of himself and his present assistants, and that by concentrating his labours, and those of his department, on these large and important works, and postponing the commencement of others till these were thoroughly and efficiently completed, the public interests would be best consulted, and a judicious expenditure of the large sums sanctioned for these works secured."

The order based on that dissatisfaction.

139. From these remarks it appears, that the great defect in the Road Department, and the main cause why it had not effected all that was expected from it, was considered to be the want of an effective executive; of that very aid which had been refused on Captain Best's application. We will not here stop to consider whether this cause was really the only one; but will merely observe that the course taken to remedy the want thus recognized, was not to strengthen the executive portion of the department, so as to enable it to carry out the projects of the professional and directing portion; but to sacrifice the advantage of having such a professional head to the department, by making Captain Best himself, almost exclusively an executive officer. The order proceeds as follows:

" The Governor in Council resolves therefore to lay it down as a general rule, that the Superintendent of Roads should confine himself to the execution and completion of such great lines of road only as he can personally and efficiently inspect; and he is of opinion that a system of superintendence, based upon this principle, by which the energies of the Superintendent and his department will be concentrated, will in the end be found the most economical and effective, and better calculated to yield permanently beneficial results than by the plan now pursued by that officer of passing hurriedly throughout the whole Presidency, leaving the works in progress to his assistants without his frequent supervision.

" At all events it is certain that by the stimulus of Captain Best's personal direction and superintendence, what is done will be well and effectually done under this system. Unexpected difficulties will be met and provided for at once by his professional skill, on view of the locality, which would be an occasion of delay if it were necessary to refer to him at a distance. Mistakes will be quickly corrected which might be mischievous if not discovered and remedied in due time. The Superintendent closely observing the execution of work, may see occasion to alter his plan at particular points, so as to improve the road. The practical experience gained by him in overcoming a difficulty at one place, will teach him how best to avoid or obviate a similar difficulty at another. He will learn expedients to meet every variety of exigency arising from the variety of circumstances he meets with. The work must therefore be better, as well as more promptly executed."

Effects of this order.

140. This order reduced the Road Department, in the formation of which so much had been intended, and from which so much had been expected, to the position of a small executive agency, under the constant personal management of the Superintendent; its operations were to be confined to 390 miles of road only; while the rest of the roads which had been withdrawn from the direct management of the Collectors and Civil Engineers, in order to be placed under the Road Department, being 1,898 miles, were now left without any systematic management whatever. Though selected as the most important lines in the country, they were in this respect worse off than the cross-roads, and far worse off than they themselves were before the Road Department was formed, when from their importance they received a special share of the time of the Civil Engineer Department. They remained

remained nominally under the Superintendent, but he was forbidden to visit them, so that although he had to forward the bills for the work done on the previously sanctioned estimates, he could not inspect it, or speak with any confidence as to the manner in which the money had been expended.

But the worst result from the change was the utter impossibility of spending the four lacs of rupees so wisely granted. In the space to which the Superintendent's visits and expenditure were to be confined, experience had proved that he could not lay out one lac of rupees annually; indeed, when the Government objected to the expenditure of so small a sum as *Rs.* 40,000 a year, for four years, in perfecting the 125 miles of the western road, the sum he could expend on the four short lines left under his charge became exceedingly small. If this arrangement were to continue, a considerable portion of the grant would be virtually annulled, and slow as the movements of the Road Department have been already, the progress for the future would be much slower still. We find, however, that since this order was issued, estimates to a considerable amount have been sanctioned out of the Four-lac Fund, on lines not actually enumerated in the list above quoted: but still the main portion of the trunk roads are left without certain supervision, and it will be impossible to spend even one-half of the annual sum granted by the Honourable Court, while the order is in force, without drawing largely on the overworked Civil Engineer Department for this extraneous duty.

An objection by Government to one part of Capt. Best's management.

141. This seems a fitting place to advert to Captain Best's reply to one objection taken by the Government to his management, in their proceedings of the 31st January 1851, just noticed. That objection is contained in the following extract:

"Another deficiency in Captain Best's arrangements, which has been observed more particularly in the papers referring to the northern trunk road, is the absence of that provision for its due preservation and repair which the Honourable Court of Directors has insisted upon in para. 5, of their despatch of 23d September 1845, quoted below.

"'We attach peculiar importance to the rule thus stated, that ample provision should be made for the due preservation and repairs of a road at the time of its formation, and we trust that it will never fail to be kept in view; we fear that it has been much lost sight of in forming the lines of road on which such large sums have recently been expended.'"

His reply.

142. Captain Best shows, in the annexed passages from his letter of the 25th March 1851, that these observations were recorded by Government under a misapprehension of the actual facts:

"18. The northern trunk road is no less than 676 miles in length; but of all that distance, only two parts can be said to have been formed (and they were never completed), viz. one between the 27th and 118th miles, the other between the 626th and 676th miles. Between the 27th and 118th miles, what has been done was almost entirely completed before 1845. Very soon after the Road Department was established, I prepared estimates for the improvement of it, and to make provision for its repairs; these were sanctioned in Minutes of Consultation of 20 October 1846, and the road has been kept in good order ever since. My estimate for bridges, and the still further improvement of this portion, was ordered to lie over in Minutes of Consultation, of 4 June 1850. For the remaining portion, viz., that between the 626th and 676th miles, provision for repairs was allowed in my estimate, sanctioned in Minutes of Consultation of 28 September 1847, and so far as the road is made, it has been kept in good repair ever since 1847. I also made estimates, and this department has been engaged in work on the northern line, between the 3d and 27th miles; but as sanction was granted only for earthen embankments and drainage, and has been refused for the bridges and metalling, it could not, and has not, come into use as a road, and of course no provision for repair was made in this case. That the whole road is not good arises from its wanting the further improvements, to arrange for which, I travelled northward in May last, and for which Captain Campbell has lately sent me an estimate.

"19. There has been great expenditure upon other parts of the northern trunk line; but the work done (I cannot call it the road made), for the money laid out in 1823 to 1828, has long been beyond the possibility of repairs; consisting, as it did, of marking out an ill-selected and too narrow road, by the planting of too narrow avenues, the improvement effected must have been problematical from the

first, and the bad, but costly track has only been growing worse and worse, as the trees have grown bigger and bigger.

" 20. The Honourable Court's order directs, that ample provision should be made for the due preservation and repair of a road at the time of its formation. In no one instance have I failed to furnish, and solicit sanction for, estimates for such provision, whenever a portion of trunk road has been formed or much improved. In the Memoranda referred to in Minutes of Consultation of 31 January 1851, I proposed, so long ago as November 1845, that similar provision should be made for the trunk roads throughout their whole extent, and I have suggested the same in other papers. I append a list of the sums now annually allowed for the maintenance of different portions of trunk roads, the total of which is *Rs.* 72,394. 3.

" 21. And besides these, I have submitted special Estimates for the maintenance of Nos. 1 and 5, roads in Salem; for part of No. 8, between 185th and 194th miles near Trichinopoly, as well as for No. 10 road between Raneepett and Chittoor, and Chittoor and the Mysore frontier, 'during the time of its formation;' for all these I solicited annual sanction, but the Government granted sanction for one year only in the two first cases, (and thus prevented my forming the establishment for the Salem Roads), and in the last case have taken no notice of my application, which was in literal and exact conformity with that order of the Honourable Court which I am found fault with for neglecting."

Thus it appears that Captain Best had not failed to perform his part in making arrangements for the maintenance of all the roads which had been completed; and that where such arrangements had not been carried into effect, it was because the Government had not seen fit to grant an allowance for that purpose as recommended by him.

Some points to be specially considered.

143. Having thus sketched the history of the Road Department, and shown that it has failed in many of its most important objects, we will now examine the results in somewhat more detail, and state our opinion as to the causes which have led to the failure; and in so doing we shall consider the following points:

First.—From what cause has so large a portion of the " Four-lac Fund" remained unspent?

Secondly.—With what effect has the money expended been laid out?

Thirdly.—What portion of the whole expenditure has been spent by the Road Department, and what by officers of the Revenue or Civil Engineer's Department?

Fourthly.—Has the sum spent been applied to the works most required, and to such only as were intended by the terms of the grant?

Fifthly.—What has led to so great an accumulation of unadjusted bills?

The first point; the small amount expended by the department.

144. The first point is—" From what cause has so large a portion of the 'Four-lac Fund' remained unspent?"

In his reply of the 25th March 1851, to the remarks on the department in the Minutes of Consultation of Government, 31 January 1851, Captain Best assigns as the cause of the failure that he had not possessed that amount of assistance, or enjoyed that measure of the confidence and of the support of Government, which he had been led to expect when he undertook the expenditure of four lacs of rupees yearly. His language on these points is as follows:

" 4. I do not pretend to have in every respect carried out to the full extent all that was mentioned in the memoranda of the 20th, 26th and 27th November 1845. In stating then what I hoped the Road Department might be able to effect, I may have proposed to my ambition objects not quite within my reach. Yet, on carefully reading over those papers, and having experience of what really has been, and has not been effected by the department under my orders, I can come to no other conclusion, than that the causes of my having fallen short of the expectations I held out were, most of them, beyond my control. Those memoranda show what I thought might be done under certain conditions of assistance and confidence, which were many of them mentioned in the papers themselves, others *vivâ voce* in interviews with which I was honoured by the Most Noble the late Governor; and as that help has not been granted to me, considerable part of the failure which is stated to have occurred may not rest with me.

" 5. It may be my fault that I have not sufficiently insisted upon the want of such assistance, not often enough reiterated my requests for it. But when my applications have not been listened to, or have been negatived, I have supposed it my

my duty to abstain from re-urging them; continuing my best endeavours to execute the works sanctioned, as well and economically as the means granted me might permit."

" 8. I observed that the expenditure could not reach the maximum limit until an establishment should be formed. I calculated upon having at least one officer under my orders, qualified by education and experience to assist me from the first. I anticipated difficulty in procuring Overseers, Maistries and others versed in the peculiar duties of the department; and in a letter (5th March 1846) I brought this circumstance particularly to the notice of Government, and proposed an arrangement for supplying the deficiency, which I still am of opinion would have answered the purpose, but which was not approved. In another letter (7th March 1846) I applied for five Overseers and eleven Assistant Overseers to begin with, and requested certain powers to enable me to control them, and stimulate them to exert and improve themselves; but these applications were not acceded to. There have never been more than 11 Assistant Overseers in the department; none has yet been promoted to the rank and pay of Overseer; and I have been obliged to instruct every one of my subordinates, and even very many workmen, in all but the elementary parts of their work. In my General Report (dated 9th August 1848), I again brought this subject forward.

" 9. In two memoranda dated 2d November 1849, I again pointed out the difficulties under which the department laboured and still labours in this respect, and submitted a scheme for the outlay of the four lacs of rupees, and a scale of superintendence. But I have never been made acquainted with the views of Government on this subject, or on many other fundamentally important points, connected with the duties which I am now declared to have performed in so unsatisfactory a manner."

" 11. Few Engineers or Architects in England employed on works of magnitude would be restricted as I have been, in the first place by the absolute absence of qualified subordinates in sufficient numbers; in the next place, by not being allowed my own choice from limited numbers; and thirdly, by want of power to control those chosen for me.

" 12. My assistants, and generally all my subordinates, have now acquired knowledge, as, under many discouraging circumstances, they have always shown the most exemplary zeal; but time was of necessity lost, and some work may have been done not so well as I wished, while they were becoming instructed. Their numbers are still as defective as when I wrote on the subject in November 1849; and I think it but fair that I should mention as one result of my work, which may easily have escaped the notice of Government, that I have thus instructed a small body of efficient subordinates."

" 15. The expenditure in 1848, 1849 and 1850, would not have been so large as it has been, had it not included the outlay in those years upon seven miles of No. 8, on 13 miles of No. 9, on the Perumbuddy Road and Ghaut, on the Trichinopoly, Cauvery and Coleroon Bridges, and on the Cauvery Bridge at Bowaney, works under the superintendence of the Civil Engineers. But I am perfectly convinced that had the establishment I required been granted to me, and had the scheme proposed in my memorandum of the 2d November 1849 been approved, and had estimates been sanctioned in time for me to make arrangements in one year for the work to be done in the next, I should have been able before now to expend four lacs of rupees, annually, and by the direct agency of my own department, with as great economy and to greater advantage than has ever yet resulted from an equal expenditure on roads in this Presidency. Nor should I have failed to introduce some improvements into the method of executing works, although it might have been necessary for me to make numerous, almost continual journies from one end of the Presidency to the other. I am compelled in my own defence to write what may appear boastful; but I infer from experience of what has been done under many difficulties, what might have been done had they not existed."

145. It will be observed that Captain Best was still of opinion, that with the assistance at first promised him (one Engineer officer), and with such a subordinate establishment as he had proposed to raise, when his scheme was rejected in March 1846, he could have spent four lacs of rupees yearly upon the trunk roads. We cannot but think that on this point the Superintendent was too sanguine. There is nothing in the working of the small department he had organized that gives

Not sufficient to account for it.

gives fair grounds for such a supposition. The work done on the trunk roads by the Civil Engineer's Department had not in any one year been inspected; the Northern Road alone would have required the attention of himself and his Engineer Assistant for several years, to lay out the line anew in many parts, to design new bridges, and to superintend the executive. And had he succeeded in raising such a subordinate department as would have enabled him to spend four lacs of rupees annually, he could not have kept even so good a supervision over the more important of his undertakings, covering as they would so vastly larger an extent of territory, as is now exercised by the Civil Engineers over the important works in their divisions, and that is justly considered to be altogether inadequate.

The department under Captain Best had a very limited charge, and under his own instructions the work was well and economically done. There can be no doubt that every year his subordinates were better able to work without his guidance; but even supposing that he had extended his department, so that each distant road could have had the advantage of his share of the sum allowed, it would have been impossible for him to have given more than a very hurried visit to each line once in a year. Without his executive duties he could not have found time for a careful examination of work, and while actually engaged in the executive in any one locality, an annual tour of his roads was quite impracticable. It is true, the Civil Engineers might have acted for him as far as their other duties allowed; but if they were to do so at all it would be better that they should act on their own responsibility, and be amenable to their legitimate superior, the Board of Revenue. The object of a Road Department was lost when it had to trust to the Collectors and Civil Engineers, who had been relieved from the charge of the trunk roads, because they had not time to devote to their management.

The entertaining and holding out hopes that an establishment under the control of one officer, even if he had a professional assistant, could, in any moderate time, bring all the main roads of the Presidency in to order, and keep them so, was, as it appears to us, Captain Best's only important error.

Though they, no doubt, operated to a considerable extent.

146. But though we cannot agree with Captain Best that the causes which he assigns for the deficiency in the operations of the Road Department are by any means sufficient to account for it, yet we acknowledge, as every one must, that those causes must have had no inconsiderable effect in hampering the department. It must be admitted by all that he could not, without an Engineer Assistant, do as much work as he could have done with one; that when the efficient subordinate agency on which he had calculated was withheld, he could not be reproached for failing to fulfil the expectation which he had held out; that when his establishment was so constituted as to be incapable of extension by the education of new members, his work must necessarily proceed very slowly; and that had his estimates been sanctioned instead of being refused as too large, more work would have been done. Captain Best did not say too much when he pointed out these causes for time being lost, but we cannot admit that the whole of this irreparable loss of years is to be thus accounted for.

The second point; the results of the actual expenditure.

147. Our next point for consideration is, what has been effected by means of the money spent? While works are in an unfinished state, a correct estimate of the value of the progress made can only be obtained by a very careful comparison of the work done with the expenditure. The Government has had before it statements of money spent, but never any connected or clear report upon the improvements resulting from the outlay; nor indeed is such a paper in existence, for Captain Best's general reports are upon the estimates and bills; the actual condition of the road is specified in but very few cases. We have drawn up a statement, however, compiled from Captain Best's monthly reports and other sources of information, giving as correct and concise a view as we can arrive at, of the works executed and the sums they have cost. This statement is in the Appendix (H H.), and we feel sure that it will be held to prove satisfactorily that all the money spent has been most economically used. We beg to call particular attention to its details, as without that it will be impossible to realise the whole result of this expenditure. We doubt, indeed, if any one accustomed to works of engineering in England will, even after examining the paper, fully understand the amount of work performed and difficulties overcome by the outlay of this small sum of 130,000 *l.*

Extent of roads made, and of bridges built.

148. The extent of road made through a country which in England would be thought

thought a most difficult one, is 296 miles; 660 miles have been kept in repair, and one mountain pass, which in any part of Europe would be considered a magnificent work, has been nearly completed in three seasons of six months each. If the amount of labour expended on such undertakings as these cannot be clearly explained, yet the list of masonry works will at all events be well appreciated. Several great losses have to be included in summing up these charges; losses which must be considered as legitimate expenditures in the bridge-building of India, where it answers better to run the risk of an unseasonable flood than to go to the expense of such dams as would secure the work against all dangers. By the destruction of a great part of the Coleroon Bridge when nearly completed, a heavy loss was sustained; including which sum, and another severe loss on the Cauvery, the cost at these most difficult sites is about *Rs.* 55 (5 *l.* 10 *s.*) for each running foot of bridge. The foundations of the Cauvery and Coleroon Bridges rest on pure sand, and the rivers are subject to heavy annual freshes, causing constant changes in their beds.

The Western road.

149. One of the subjects specially noticed by the Honourable Court of Directors, in their Despatch of the 31st January 1850, was the Western trunk road. And therefore, in answering this question, "What results have been produced by the money spent on the roads?" we will give a more particular account of the expenditure on that road. In reviewing a report made upon it by Mr. Forlong in September and October 1851, the Government expressed their disapprobation of its condition; and it has evidently at all times been considered the main test of the success or failure of the Road Department.

The sum spent upon the road between Madras and Vaniambaddy from April 1845 to May 1851, was *Rs.* 3,71,212, exclusively of the cost of superintendence. This sum Captain Best divided into "completing," "repairing," and "maintaining" the road; a correct and useful division of the charges when a road has once been completed; but in this case, the road never having been perfected, the division is too arbitrary to be of any value, since no one can say of a road with so uneven a surface, what repairs were necessary to counteract the effect of weather and other causes of injury, and what to replace the metal removed by the traffic. We shall therefore consider the whole sum as spent under the head of "repairs," and inquire what has been gained by the outlay.

Its condition when the Road Department first took charge of it.

150. The last report written upon this road before Captain Best took charge of it, was by Lieutenant James Johnston, of the Engineers, who was sent to inspect it in the early part of 1845. Of this report, Colonel Sim, the Chief Engineer, wrote as follows:

"From Lieutenant Johnston's report, it will be seen that the state of the road is much worse than was apprehended. Several bridges and tunnels have been destroyed by the last heavy rains, and the surface of the road is generally very uneven, in many parts full of holes and ruts, and rapidly breaking up; and throughout the whole distance, the covering of laterite and gravel is consideraly worn. The chief causes of the rapid deterioration of the road are, the very great amount of traffic (which at the same time proves its vast importance), the want of hardness and durability of the materials with which it is formed, and the insufficiency of the repairs which it has received since its construction. The total cost of repairs executed between Madras and Vellore during the last two years amounts to only *Rs.* 8,651. 7. 1., or *Rs.* 4,326 yearly; a sum manifestly inadequate for the purpose. There are also some defects in the original construction, which tend to lessen the durability of the road: these are the unnecessary height to which it has in many cases been raised, and the having raised and covered with laterite or gravel the whole distance, instead of taking advantage of the natural surface of the country, where that was hard and permanent, by merely levelling and draining it. If this had been done with care and judgment, a good road for all practical purposes might have been made at a far less original cost, and which would have required a much less annual outlay to keep it in repair. Unfortunately, these defects cannot now be remedied; but it is still a noble and most useful work, and well merits the expense of being kept in repair."

Its gradual improvement for many years past.

151. At that time even the bandy traffic had great difficulty in passing certain parts of the road; but from the date of that report it has been gradually improving, while the traffic has greatly increased. The following memorandum, taken from actual correspondence between a Madras merchant and his constituent at Walla-

jahnuggur shows clearly the great reduction in the cost of carriage, in proportion as the road has been improved.

	Rs.	*a.*	*p.*
In 1823, the hire of a cart from Wallajahnuggur to Madras, carrying 37½ maunds or 900 lbs., was - - - -	7	–	–
In 1835 - - - ditto - - - ditto - - - -	6	9	–
In 1837 - - - ditto - - - ditto - - - -	5	–	–
In 1844 - - - ditto - - - ditto, carrying 1,000 lbs.	4	8	–
In 1845 the Road Department was formed.			
In 1847, the hire of a cart from Wallajahnuggur to Madras, carrying 1,000 lbs., was - - - - - -	4	–	–
In 1851 - - - ditto - - - ditto, carrying 1,600 lbs.	3	10	–

Before the year 1823, there was " no road," as the merchant expressed it; but from that time large sums have been spent upon the line, and the cost of carriage has been gradually falling as the improvements progressed. It will be seen that since the Road Department commenced its operations, the cost of carriage has fallen about one-half, although the demand for it has been as regularly advancing, as is shown by the increase of exports from Madras. Indeed, if we had not this evidence, the fact that post travelling carriages can now be worked upon the road at the rate of six miles an hour, with profit to the owner, if not very agreeably or luxuriously to the traveller, is of itself sufficient proof of the great improvement which has taken place since 1845.

Comparison of this road with the principal road under each of the other Presidencies.

152. We will now consider whether greater improvement could with good reason have been anticipated, or by good management effected, in return for the money spent. Captain Best, in his second Report, dated 17 October 1851, draws a comparison between the great Western Road and roads of other countries, thus:

" 22. It is not easy to apply the rules established in England from the experience of road-makers there to the circumstances of this country. Differences of climate, in the nature of the materials procurable, in the nature of the traffic and vehicles, render what are sound maxims there, bad guides here. In this Presidency, no road similar to this affords data by which to form correct estimates of its requirements. I have endeavoured to procure information from the other Presidencies, and have obtained it from Bombay. But the Superintendent of the Agra trunk road has not favoured me with the result of his experience, and I have no particulars of that work, except such as I have gathered from Part II. of Selections from Public Correspondence, published by authority, N. W. Provinces, and from some of the public prints. The former dates no later than May 1845.

" 23. It appears, however, from these, that ' Kunkur ' is obtainable without great difficulty along all these lines, that laterite and gravel are all but unknown, and that whatever material be procurable it is laid on without stint, there being no limit to the outlay which the Governments of those Presidencies are willing to incur. It does not appear either that there is any road in those Presidencies on which the number of carts that pass daily is nearly equal to that with which the road No. 1, between Madras and Poonamallee, is covered from morning to night.

This road has much more traffic than either of those;

" 24. In the Calcutta Review, No. XXVIII., December 1850, a statement (swelled up by counting camels, bullocks, horses, sheep, goats, elephants and foot-passengers) is given of the traffic of the Agra trunk road for an entire year; in this, 48,489 laden and 14,417 unladen hackeries are enumerated; but the number of carts that pass yearly between Madras and Poonamallee is at the least six times as many, and there is no part of No. 1 road between Vellore and Madras, where it is not more than thrice as many, while on the remaining 40 miles out of 125 it is more than equal. The number of carts that passed up and down the Thul Ghaut in the Bombay Presidency, between September 1848 and the 15th June 1849, was 38,528, drawn each by two bullocks, and 113 drawn each by four; this is about two-thirds of the number that pass along our road at Waniumbaddy, one-fourth of the average number along the whole line, and one-eighth of the numbers between Poonamallee and Madras.

And therefore requires more repair.'

" 25. From this it is easy to understand why the trunk road, No. 1, requires a large quantity of material to replace that which is worn out by the traffic. I have been very anxious to ascertain the quantity, and had taken measures for doing so, but they were frustrated by circumstances I could not control. The quantities worn off the Presidency roads would serve as some criterion, but that they undergo the wear and tear of carriages only, not of bullock carts. European and American engineers, who rightly insist much upon the importance of keeping up a road, as distinguished

distinguished from repairing it, calculate the quantity of material for alimentation rather than reparation, sufficient to make up the annual loss and diminution of depth, at from two-thirds to one cubic yard per mile for every animal employed in draught. Considering the inferior construction of carts in this country, the narrowness of the tires, and the looseness of the wheels on the axles, and also the brittleness of the stone, and the extreme drought, it may be at once admitted that at least a cubic yard should be allowed per mile per cart on our roads."

We have not the information from which Captain Best calculated the number of bandies passing daily, but there appears to be some great oversight in stating it so low as 352 per mile, since that is less than the number given in the Report of the 1st May 1848. Lieutenant Forlong, from whom Captain Best's information on this subject was chiefly obtained, and who has lately made further inquiry, gives the number of carts at nearly double that above stated, viz. at 667 daily per mile; it is possible that Captain Best reckoned only the fully-laden carts.

Comparison of it with the Colombo and Kandy road.

153. While reviewing this subject, we have had an opportunity of obtaining from Mr. Norris, the late Civil Engineer of Ceylon, the cost of keeping in repair the Colombo and Kandy Road, which has a heavier traffic than any other in the Colony, and is kept in the very highest order:

Distance from Colombo to Kandy, 72 miles.
Cost of maintenance, &c. in 1848 - £. 15,263 } average, £. 208 a mile
Ditto - - - in 1849 - 14,677 } annually.

As this information will be useful as a test of the value of Captain Best's work, we will endeavour to show how a fair comparison may be drawn between the charges on the Western Road and those on the Colombo and Kandy Road.

The climate of the island differs from that of the Carnatic in having a longer season of rain; but the excessive drought and heat of the country in the neighbourhood of Madras is probably not less injurious to the surface of a well-drained road than the monsoon of Ceylon, a point on which we can speak with some confidence from the effect produced on the Palghat and Ponany trunk line, which is in a climate precisely like that of Colombo. In this particular, therefore, the roads are on an equal footing, and they are also similarly circumstanced in having the main traffic carried on upon carts drawn by a pair of bullocks, but the Colombo Road, being in higher order, the average weight of the loads is greater; the difference in this respect is, however, more than counterbalanced by the use in Ceylon of well-made axles of English manufacture, the rude axles of India being most destructive to the roads, and a constant cause of complaint by those in charge of them. Metal is procured on an average within one mile and a half of the Colombo Road, while much of the supply for the Western Road has to be carried eight miles. There is, however, great difference in the value of money in the two countries, the cost of carriage being four times, and of labour twice, as high in Ceylon as under this Presidency; making due allowance for this circumstance, we will take the rupee to be worth only one-third in the former country of what it is in the latter. Even on that hypothesis, the cost of such a traffic as that of the Western Road, at the rate actually paid on the Colombo Road, would be *Rs.* 4,000 a mile annually; whereas we have seen that the actual expenditure has been no more than *Rs.* 472 a mile yearly.

These facts appear conclusive proof that the expenditure on the Western trunk road has been very economically managed; the road has improved, the traffic increased, and the cost of carriage fallen to two-thirds of what it was, and this at a cost, when compared with the traffic, equal to one-eighth of the sum, which, making allowances for the difference in the value of money, &c., would have been considered necessary in Ceylon, for the mere maintenance of a road already in the highest order.

Captain Best's early opinions as to the cost of maintaining a road were too narrow.

154. Captain Best did not pursue the same system of road-making from first to last, from which some may infer that his first expenditures were not made on the most judicious principles. Such may, perhaps, have been the case; but as we find that every change was on the side of more liberal outlay, it seems evident that he had been at first too sanguine as to the cheap rate at which given results might be attained, and that he had aimed to keep down his charges to the utmost; as he

gained experience he was obliged to make larger demands: and as he did so he approached more and more nearly to the real necessities of the road.

The Great Western Road is already in better order than Captain Best considered necessary for the trade when he took charge of his appointment. At that time he argued in favour of the expenditure on roads being extended over much greater distances; but the necessity for bringing the surface of this line into a condition to admit of fast travelling obliged him to demand a much larger sum than he originally intended to spend upon it; and it may have been on that account that the necessity for his greater expenditure was questioned, and his estimates refused. In his General Report of August 1848, when speaking of the Western Road, he says (Para. 27):—

"The other estimate, submitted by me with the same letter, was intended to supply the material wanted to bring the road into good order; for, as I stated in that letter, the quantity of material on the road had been worn so thin that this appeared necessary to prevent it from breaking up; the amount was *Rs.* 1,68,263. 15. 0., and I anticipated that it might take four years to execute, the total work of both estimates being sufficient to employ 400 carts continually for eight months in every year, together with a proportionate number of labourers for digging, breaking and spreading material.

"But this estimate was not sanctioned. 'The Governor in Council thought Government should pause before sanctioning so large a portion of the Four-lac Fund on such a comparatively small portion of one trunk road.'

"I was, therefore, forced to confine my endeavours to keep the road from getting worse; and even to do this with such limited means was difficult, because, in the first place, the annual allowance, averaging a thickness of only $1\frac{1}{13}$ inch, was not sufficient to make good the want of material, to provide which my other estimate was prepared; and, in the second place, the estimate for maintenance allowed for gravel and laterite only, at average rates of 2 annas, and 2 annas 7 pice for digging and breaking, on the supposition that stronger and more expensive material to form a substratum for it would have been granted."

Concluding remarks on the Western Road.

155. Captain Best has here given his reasons why the western road has not been brought into better order, and as his expenditures generally produced such good results, it must be admitted that the sum he then demanded would have made a very material difference in the condition of the road, if it had not brought it to perfection. He effected great things with the money allowed him, and without more means no more could be expected.

The estimate that was then rejected had been prepared after the most mature consideration; by a comparison of the effect of the actual traffic on the line, with the results obtained in other countries, and from data most carefully and cleverly collected on the road itself. Amongst other plans adopted to determine the loss of material occasioned by the wear of the bandy-wheels, we find him measuring the difference between the loss of material on the two sides of the road near Madras; as on one the bandies entered the town almost all loaded, while on the other a certain known proportion of the carts returning inland were empty. The difference in the wear of metal was sufficiently appreciable, and afforded him some means of calculating the actual quantity displaced by each ton carried on the road; Captain Best had a peculiar talent for the collection of such data, and was constantly correcting his calculation of quantities to bring them nearer to the truth; and certainly no one in the country could form a judgment as well as he could, of the necessities of the road.

On the western trunk road the Road Department cannot be said to have fallen short in any way. The executive was under the constant supervision of the Superintendent himself, whose instructions to the Assistants and Overseers are in the most elaborate detail. The books of the office contain page after page of most ingenious suggestions for the perfection of work and saving of expenditure, and hardly a day passed that some new expedient was not adopted for turning the labour of the department to greater account.

The third point; what portion of the expenditure was superintended by

156. We will now inquire what part of the Four-lac Fund has been actually spent by the Road Department, and what by others.

In the 15th para. of his letter of the 25th March 1851, above quoted, Captain Best

Best enumerated the following works, as having been executed under the superintendence of the Civil Engineers; and we have added their cost:— the Road Department.

	Rs.	a.	p.
7 Miles of No. 8 road	8,239	–	–
13 ditto of No. 9 ditto	16,017	–	–
The Parumbuddy Ghaut and Roads	1,83,135	5	2
The Cauvery Bridge at Trichinopoly	28,129	11	4
The Coleroon ditto near ditto	1,10,488	11	–
The Cauvery ditto at Bowany	35,900	–	–
TOTAL	3,81,909	11	6

But, in addition to these, the following so completely occupied the time of officers of the Civil Engineers and Revenue Departments, that they must be placed in the same list:— Works to a very large amount were executed or superintended exclusively by the Civil Engineer's Department.

	Rs.	a.	p.
Maintenance of the Perumbuddy Road and Ghaut	3,400	–	–
Repairs of the road from Waliaur to Ponany	7,700	13	3
Maintenance of ditto	1,703	12	3
Ditto ditto ditto	2,496	3	9
Ditto ditto from the 324th to 394th miles of ditto	6,981	14	9
Construction of Nurrumgumpilly Bridge	5,903	9	6
Improvements between Waliaur and Ponany	6,688	14	11
Maintenance of road from Itchapore to Berhampore	720	–	–
Ditto ditto ditto	720	–	–
Ditto from Berhampore to Bengal Frontier	3,360	–	–
Ditto ditto ditto	3,607	1	1
Repairs from Itchapore to Berhampore	6,912	14	–
Construction of bridge over Bimlipatam river	8,000	–	–
Ditto of road from the north bank of the Cavery to the south bank of Coleroon	8,239	13	6
Ditto of road from the south bank of the Coleroon to Samiaveram	22,858	12	–
Maintenance of road from Samiaveram to Trichinopoly	2,494	11	–
Construction of New Head Sluice to Northern Rajah Voykal	4,000	–	–
Ditto of Goolcherroo Road and Ghaut	7,359	5	11
Continuation of ditto ditto	12,000	–	–
TOTAL	1,15,147	13	11
GRAND TOTAL	4,97,057	9	5

Thus we see that out of a total expenditure of 13 lacs, nominally under the superintendence of the Road Department, very nearly five lacs, being considerably more than one-third, was really expended by other departments; and the cause of this result unquestionably is, that the Road Department was on a scale utterly disproportioned to the work laid upon it.

157. And the works above enumerated were projected as well as executed by other departments, and occupied no slight portion of the time which was required for the proper duties of those departments. And were projected by them also.

In the first Division, the Civil Engineer having been called upon for assistance, declared that he had not the means of giving it, and so no work was done in that Division. In the second Division the Assistant Civil Engineer has been occupied for two years and a half on a part of No. 12 trunk road; viz., in the construction of the Goolcherroo Pass, on the road from Cuddapah to Chittoor. In the third, the new works were projected by the Civil Engineer's Department, while those managed by the Road Department have only been inspected once in six years. In the fourth, the Road Department has done its own work. In the fifth, the Assistant Civil Engineer has been fully occupied the whole of two working seasons, on the works of the Road Department, while the Nerunjapett Channel, and other important works of his own department, have been in abeyance. In the sixth, the Civil Engineer has managed the great bridges over the Coleroon and Cauvery, while,

while, as we have said elsewhere, several fine works of irrigation in ruins were waiting in vain for a share of his attention. In the seventh, one executive officer has been working on the part of the Road Department, but the Head Assistant Collector of Malabar has done the work on the Walliaur and Ponany road, while the Civil Engineer has been considered the supervisor of the Perumbuddy Ghaut and roads. In the eighth Division no work has been done.

Thus the Road Department has totally failed to relieve the Civil Engineers.

158. These facts will show how completely the Road Department has failed in relieving the Civil Engineers, or in bringing the trunk roads really under that separate management, for providing which, with vigour and efficiency, the new department was formed.

The road fund, in fact, by supplying the means, has led to a great increase of labour to the Civil Engineer's Department in this description of work; and thereby has rendered it still more inefficient than it was before for the management of works of irrigation; a result, the very opposite of what was contemplated when the new department was formed.

Yet no one who inspects the records of Captain Best's office can question for a moment his capacity or activity; his labour was incessant, his exertions untiring. Indeed, the complaint made by the Government that his movements were "hurried," was quite true as matter of fact; but they were so from the very necessities of his position, from the heavy and multifarious duties laid upon him, without any adequate assistance. The late energetic Superintendent would not admit, indeed, that he was hurried; but we find him constantly striving to be in different parts of his enormous charge at one time, and many promised visits were necessarily delayed. He shows that he had made "but one sole inspection of a great portion of the trunk roads since 1845." And although he states, in 1851, that he had "inspected every part of the northern, southern and western roads, on which his assistants had been superintending work, from 10 to 30 times," yet, in a Report sent in to the Government the year before, he says, in reference to one of the roads that he had so frequently visited, "I receive Reports and Journals in which progress is detailed, but the not being able to give personal and continual attention to a work of this kind causes me much unpleasant anxiety."

The fourth point; has the actual outlay been applied where most required?

159. To the question, has the sum spent been applied to the works most required, and to such only as were intended by the terms of the grant, we cannot say that it has.

The terms of the original grant are not very definite; but it seems evidently to have been the intention that no extensive new works were to be undertaken, till the existing lines were put into good order. Under this supposition, it can hardly be said that any of the larger works executed by the Civil Engineer's Department should have been charged to that fund. The Honourable Court, however, having given their sanction to that appropriation of the fund, no objection need be raised; but in speaking of the results of the department falling short of the anticipations formed when the annual allowance was sanctioned, it must not be overlooked that the money has been spent on those great works, while more than a thousand miles of the great trunk roads have remained untouched.

The most necessary works were not undertaken;

160. Nor were even those works selected as of first-rate importance; although each one is an essential part of a complete system of trunk roads, many of them are of less immediate importance than improvements not yet undertaken. The Cauvery bridge at Bowany, is in the very centre of the peninsula, a point from which the trade flows away to the sea on either side; it will therefore have very little traffic over it compared with any of those rivers near either coast, where the traffic having converged, has reached its maximum. The great bridges near Trichinopoly, though most useful works, were by no means so urgently required as a passage over the Palaur on the Western Road, or across the Ponany River near the port of that name in Malabar.

But those which the Civil Engineers had projected, and were prepared to execute.

The works selected have been chosen, not because they were the most urgently required, but because the Civil Engineer Department had projected them, and was prepared to carry them into execution; the Four-lac Fund supplied the means, and they could be completed without an increase of the Road Department; but not of course without a corresponding loss, or more probably a much greater one, to the general improvement. Had the Civil Engineers' labour been expended in their proper duties, work of the same extent would have been done for the better irrigation of the country, or the improvement of its cross-roads. The Honourable Court's grant was given as a clear addition to such expenditures; but the trusting

its

its management to a crippled department reduced it to a sustitute for other grants, and defeated the object of the boon.

The fifth point; the large amount of unadjusted Bills.

161. The answer to the next question is simple enough, "Why bills to so large amount remain unadjusted." The accounts, though kept with the most minute accuracy, could not be brought to an adjustment, because there was no inspection; we find bills to the amount of *Rs.* 8,34,427. 7. 3. of the whole outlay still hanging over the executive officers, though much of the work was done and paid for several years previously. It might be supposed from this, that there was some negligence in the office of the Superintendent; but no supposition could be farther from the truth. The bills might have been settled at any moment, could the works have been inspected and compared; but this the department had not the means of doing; and there can be no doubt that if the expenditure had ever increased to the whole amount sanctioned, the difficulty on this point would have increased in proportion.

The present state of the Road Department.

162. The present state of the Road Department then is as follows: the Superintendent is the head of a small establishment for the management of work in execution on a very limited extent of road, which is not to be carried on beyond the reach of his own personal inspection; he still, however, retains nominal charge of the whole of the trunk roads, though he is not to visit them, and has only the power to apply to the Civil Engineers for such aid as they can give when their other duties admit of it. The accounts of works still in progress on roads at a distance from Madras, are sent in to the Superintendent, and must either accumulate in his office, or be sent up by him to Government without any comparison with the work executed; while the bills for work done on those roads which are still under the Superintendent's own personal management, are sent up by him for sanction without any check but his own; though he is the very officer on whose pecuniary responsibility the work was done.

Under the order of 31 January 1851, the expenditure of money ought to be limited to what the Superintendent can manage personally; but it seems to be understood that a further outlay from the fund may be made where the Civil Engineer's Department will undertake the executive management of the work.

The Superintendent, acting strictly up to the order, could not carry on more work than is in progress within the very confined range therein specified; and even within that range he could hardly adhere literally to the order; for he could not visit the working party south of Oolundoor, or those in the neighbourhood of Chittoor, without being absent from each work at least 20 days.

The employment of the Civil Engineers in executive duties on the trunk roads is an evil.

163. The Civil Engineers may possibly be well employed upon bridges, ghauts or other important works on the trunk roads; but as there is not one division in which other improvements are not obliged to lie over, while the time and attention of the Civil Engineer, or his Assistant, is engrossed by the executive management of such works, it is evident that an expenditure from the Four-lac Fund becomes only a substitute for some other grant, and as it advances the trunk roads, it retards other improvement of the country. Indeed it does more than that; for by occupying the Civil Engineers with executive duties, it takes them from their more important functions of projecting new works, and supervising the operations of the revenue executive.

This result of the inefficient state of the Road Department is most injurious, as confining the very limited amount of engineering skill the country is possessed of to the execution of a few works annually. Should this system be continued without an addition of numbers, it may be expected that the progress of the country will be still slower than it has been of late years, and peculations in the Tank Department be hardly less extensive than they were formerly.

The Road Department has failed to attain the objects aimed at;

164. Having thus reviewed the working of the Road Department, we are compelled to record our opinion that it has failed, and that the failure is to be ascribed to the anomalies and incongruities of its original constitution, aggravated as they have been by subsequent measures; viz., first, by refusing the necessary subordinate establishments; second, by withholding sanction for estimates; and third, by bringing the department down into a fettered and useless position by the order of the 31st January 1851. It has failed to spend the money assigned to the roads; it has failed to effect anything towards their improvement, commensurate with the expectations held out at the time of its formation; and it has failed to afford any material relief to the Civil Engineers, or to the Board of Revenue.

And ought to be abolished.

It appears needless to inquire whether the department could be so improved as to become effective; because we think it decidedly more expedient to abolish it as a separate establishment. The considerations which led to its formation were, that

the Board of Revenue and the Civil Engineers had not sufficient leisure to attend to the roads; and that consequently their improvement had never been systematically taken up. Both propositions were true as facts, but the inferences deduced from them were unsound. As to the neglect of the roads, the Government themselves were at least as much to blame for it as the Board, as our preceding remarks have shown; for they constantly refused to recognise the policy of improving the roads, and withheld the funds necessary for the purpose. The Board and the Civil Engineers were indeed overworked; but a review of the working of the Road Department shows, that the measure adopted for their relief was far from being the proper one.

It is wasteful to have two separate departments, managing works similar in character over the same area.

165. Where public works are thinly scattered over large tracts, it is unthrifty to have separate establishments for the management of the several classes of those works.

In a country in which official travelling, with the necessary office establishment, cannot exceed 10 miles a day, and in which even the Government mail does not exceed 100 miles a day, the Road Department had its agents at work at a distance of 500, and even 1,000 miles from its head; while the Civil Engineer of the division was passing over or near the road under repair or construction, perhaps several times in the course of the year, but was precluded from interfering, except in particular cases. The Order of the 31st January 1851, removed this anomaly indeed, to some extent; but the supposed reform was effected by leaving the greater part of the main roads of the country without any superintendence or management whatever, and by employing the scientific and highly paid Superintendent to perform in person duties which would have been done quite as well under his superintendence, by any active and intelligent officer, on one-fifth of his salary.

The Road Department has always been numerically unequal to even a small part of the work originally required of it; but even if it had an Engineer Deputy Superintendent in every district, it would still be bad economy to retain it, because it would be unwise and wasteful to have officers of two separate and unconnected departments travelling over the same ground, in the performance of similar duties. Fully as well convinced as the late Governor, of the importance and the necessity of undertaking the improvement of the means of transit on a systematic and comprehensive plan, we are yet led to the decided conclusion, that in order to effect this economically and well, the Road Department ought to be abolished, and that the charge of the roads ought to be re-united to that of the works of irrigation, both in the local offices, and in the Controlling-office at the Presidency.

The main cause of failure was the dread of expenditure on "Superintendence."

166. Before leaving the subject, we would call particular attention to the fact, that here, as in so many other cases, the main cause of failure was the dread of spending money on "Superintendence."

Captain Best's tempting offer to manage every branch of the department was too readily acceded to. One Engineer Assistant was allowed him, but only a few months after it was found that a clear saving of superintendence could be effected by allowing two unprofessional officers instead of the Engineer. The consequence of which was that the whole of the most important duties of the Superintendent were doubled. Captain Best next asked for such a subordinate department as should be capable of extension as his work increased; but it was to be paid for under the head of superintendence, so a saving was effected by rejecting his scheme, and reducing the establishment so low that it was only sufficient for the work in progress. And, latterly, when it was thought necessary that no work should be carried on, except under the eye of an Engineer officer, and it was, therefore, requisite either to give further professional assistance, or limit the operations of the department, the latter alternative was chosen, and the result was equivalent to annulling two-thirds of the grant.

The first thing should have been to ascertain the lines on which roads were most wanted:

167. Had there not been this dread, the natural course, when the Road Department was constituted, would have been, first, the employment of one or more able men of any service to ascertain the wants of the country, to examine the existing traffic, and to determine where the main communication should be opened. That this point was not sufficiently attended to is already apparent; we find on an average nine bandies a day on the Mercara and Mangalore road, which was made a trunk line; while the great cotton road from Bellary to the part of Coompta on the western coast, which is not in the list of trunk roads, is described by Mr. Maltby, the Collector of Canara, as being so crowded, as to resemble "the approach to some large fair, being crowded with cattle, and lined with encamping grounds."

grounds." We might mention, as another omission, the road leading to the sea-port of Tuticorin, the natural outlet for the cotton of Tinnevelly; and as a third, a direct line from Salem to the sea; while the road from Madras to Trichinopoly, called a trunk road, and now constructing, at great cost, has comparatively little trade upon it.

Next, to determine the species of road to be made:

168. This first point having been determined, after careful inquiry, there would have been work for Engineers in all parts of the country to decide what description of communication would be most suitable in each particular locality, whether rail-roads, canals or common roads; and having settled that important question, there was employment for a number of Engineers several years to trace the lines and plan the works required. For all this no provision was made; and hence the northern road is now in progress, closely parallel to if not actually through back-waters, which, when used for navigation, afford a means of carriage at one-eighth of the cost of transit by a road, and much more rapid.

And then to survey and lay out the lines.

Next to this, executive establishments were necessary, which could act without the constant attention of an officer of Engineers in each of the Collectorates; and educated artificers were required in every trade employed.

It is possible, if not more than probable, that a whole year's allowance, viz. four lacs of rupees, might have been laid out to advantage in the preliminary investigations, traces and designs. And in such a case, although the whole bill for the year would have come under the head of "Superintendence," it might not have borne too great a per-centage on the expenditure.

The result of this mistaken economy has been to retard the improvement of the roads three years at least, to check improvements by other works, to make some portion of the advance which has been made in the wrong direction, and by keeping works in an incomplete state, to lose much of the advantage of the sum expended.

Section IV.

An Account of the Engineer Department under the Military Board, with Suggestion of some Changes in the Structure of that Department.

The Military Board.

169. We have now to describe the Department of Works under the Military Board.

The Military Board was formed at this Presidency, by order of the Honourable Court of Directors (*vide* Letter 21st September 1785, in Military Department), and appointed to consist of the following officers:—

1st. The Commander-in-Chief.
2d. The Senior Officer at the Presidency.
3d. The Senior Officer of the Artillery.
4th. The Chief Engineer.
5th. The Adjutant-General of the Army.
6th. The Quartermaster-General.
7th. The Commissary-General of Stores, with a Secretary and Assistants.

In the year 1794, the Senior Officer at the Presidency and the Commissary-General of Stores were discontinued as members of the Board; and in 1810, when the Commissariat Department was formed, the Commissary-general, as head of the Department of Supply, was constituted a member of the Board, but ceased to belong thereto in 1814, on the Honourable Court objecting (Letter dated 3d September 1813), "On the general principle that no officer should sit in judgment, or be called upon to act as a check and control over his own supplies." The Board then consisted of the following officers: the Commander-in-Chief, the Commandant of Artillery, the Chief Engineer, the Adjutant-general, and the Quartermaster-general; but this constitution was found productive of practical inconveniences, principally great delay in business, because all the members being so *ex officio*, and their time being almost wholly occupied by the duties of their own offices respectively, all the work of the Board devolved on the Secretary. With the view of getting rid of these evils, and expediting business, an alteration was made in 1839, by relieving the Adjutant-general and the Quartermaster-general from their duties in the Board, and adding two stipendiary members, in order, as stated* by the Honourable Court, "That the duties of the Board previously, to a very great extent, discharged

* Hon. Court's Letter, No. 39, of 17th June 1844.

discharged by the Secretary, might be wholly performed by the members of the Board."

Its present construction.

170. At present, therefore, the Board consists of the Commandant of Artillery, the Chief Engineer, and two stipendiary members, with a Secretary and an Assistant Secretary, and the work is arranged as follows: all subjects of importance still come before the whole Board; but minor questions and matters of routine are disposed of by the stipendiary members. The full Board sits twice a week; and, besides these meetings, there are also two "Diary Board Days," as they are called; viz., meetings formed of the stipendiary members only (though the *ex-officio* members have a right to attend if they think proper), at which the minor matters above referred to are discussed and disposed of. All routine papers, such as indents for stores, provided they are strictly in accordance with regulation, are disposed of by the Secretary endorsing on the back the usual order for the issue of the stores; and this indorsement, when initialed by the stipendiary members, is authority for the Secretary to pass the indent. The resolutions of the Diary Board, as well as of the general meetings, are recorded in proceedings, all papers of importance being recorded in full, the others abbreviated. The routine papers are briefly entered in diaries, which, with the Diary Board's proceedings, are circulated on the following day to the *ex-officio* members, in order to keep them acquainted with the whole business of the Board, and to give them an opportunity of bringing before the General Board any order of the Diary Board from which they may dissent. The stipendiary members also aid the Secretary, by writing letters, orders, and other papers on important matters; and, besides their attendance on Board days, they are usually at the office on the other two days of the week, engaged in that manner, and at hand to pass orders on emergent questions requiring immediate reply. The present system appears to have produced partially the results sought for in the change; viz. a more rapid and effective transaction of business; and the division of work between the General Board and the Diary Board is found to work well and to facilitate business.

The duties of the Board.

171. The duties of the Board, as originally laid down by the Honourable Court, were as follows:—

> 1st. To examine into the state of the musters of the troops, and to give their strictest attention that all the establishments are kept up to the full complement.
>
> 2d. To be regularly informed of the amount, both in quantity and quality, of provisions, ammunitions and stores of every kind, in forts, granaries and garrisons.
>
> 3d. To attend to the artillery arms, and implements of engineering, so that our settlements may be amply provided with everything requisite for the complete equipment of an army on the shortest emergency.

The Honourable Court mentioned these particulars as an illustration of the nature of the duty to be performed, meaning that every article of military expenditure should come under the revision and control of the Board; the arrangement was partially modified afterwards by the creation of the Audit and Commissariat Departments.

The Court explicitly desired it to be understood, that no part of the discipline of the army, or the distribution of the troops, or the application of that force, should fall under the Board's authority, those powers remaining exclusively with the Government and the Commander-in-Chief respectively. The Honourable Court also declared that the Board was not to exercise any power independently of the Government, or to have authority to issue money, or grant warrants for its issue; and the Court were of opinion that much benefit would be derived from the institution of the Board in the detail of such business as is immediately connected with the regularity, the economy, and effective strength of the army, and as a Board of reference and report, for the purpose of inspection, and to prevent abuses and deficiencies.

Their detail and distribution.

172. The detail duties of the Board may briefly be stated as follows:—It checks and controls the Commissariat accounts, as far as quantities, and charges to a limit of 25 per cent. above the previous year's charges; it checks also all the ordnance and military stores, the gunpowder and gun-carriage manufactories, the Stationery-office, the equipments of the army and the saddle contracts; and it also superintends and controls the whole department of buildings and repairs as connected with

with the army, as well as all such works at the Presidency for every branch of the service.

The work of the Board is divided in two departments; viz. the Ordnance Department and the Engineer Department; the latter comprises all buildings and repairs, and the former comprehends all the other branches of business above specified. But this division is for the sake of convenience and orderly arrangement only; the Board itself is not divided into sections, but subject to the above detailed arrangement of General and Diary Boards; all the members attend indifferently to all business brought before the Board.

The inquiries of this Commission are directed only to the Engineer Department of the Board, and having given the foregoing general view of the various branches of its duty, we now proceed to describe more minutely its proceedings in that department.

Particularly in the Engineering Department.

173. As already stated, the Board has control over all military works in the interior, and all Government buildings and works at the Presidency, whether military or civil.* This general description includes, at the Presidency, all buildings, whether military, civil, judicial, marine, ecclesiastical or general; all bridges, and all works on what are called the Government roads, as distinguished from those which are maintained by the Assessment Fund. In the interior the authority of the Military Board extends over all roads, bridges, drains, &c. within military cantonments; all military and ecclesiastical buildings and post-offices within cantonments; all forts, and Government buildings of whatever kind therein. In the Saugor and Mhow Division the Military Board has control likewise over all buildings, whether military, revenue, judicial or general, and partially so over the main roads, bridges and tanks of the country at large, comprised under the designation of the Saugor and Nerbudda territories; over the political buildings of the residencies at Indore and Sehore, and the military buildings of the contingents, as well as of Bhopal and Holkar. With respect to the work in those territories the Board act under three separate authorities; in the case of the civil and the political works they are in communication with the Governor-general of India; in the case of certain roads and bridges, and of the salary and office bills of the Engineer Department chargeable to the Civil and Political Departments, they communicate with the Lieutenant-governor of Agra; while all the military works are undertaken and carried on under the orders of the Madras Government.

Annual amount of works under the control of the Board.

174. The engineering works are distributed in 10 divisions, corresponding with the divisions of the army. The statement in the margin gives the names of nine of the divisions, as well as the annual expenditure in each of them; being the average of 20 years from 1831 to 1850. Of the remaining division, that of Saugor, with the Saugor and Nerbudda territories, the works have been under the control of the Madras Military Board only since the beginning of 1850; we have been unable to obtain accounts of the amount of the expenditure. It will be seen that, independently of that division, the whole expenditure controlled by the Board in this department, amounts to about two lacs and three quarters annually. The expenditure for buildings, &c. on the Tenasserim coast being under the Bengal Board, and that of the Straits Settlements under the Governor of Penang, both are excluded from the statement.

	New Buildings.	Repairs.	Total.
	Rs.	*Rs.*	*Rs.*
Presidency Division -	65,422	64,919	1,30,341
Mysore - ditto -	9,234	8,728	17,962
Southern - ditto -	12,796	8,593	21,389
Centre - ditto -	3,808	4,888	8,696
Northern - ditto -	5,300	4,515	9,815
Ceded Districts - -	11,101	4,827	15,928
Malabar and Canara -	13,189	4,287	17,476
Nagpore Subsidiary Force	20,308	5,580	25,888
Hyderabad Subsidiary Force—			
At Secunderabad -	17,822	2,096	19,918
At Jaulnah -	2,922	1,265	4,187
Total - -	1,61,902	1,09,696	2,71,600

The Military Board has power, without reference to Government, to direct the execution of repairs on estimate not exceeding *Rs.* 500 each; for all repairs to a larger amount, and for all new works, as well as extensions, improvements and alterations, the previous sanction of Government is necessary. Officers commanding divisions and forces have power to sanction petty repairs to buildings not exceeding *Rs.* 50 to any one building in a half year, and to order repairs of an emergent nature

* The Governor of Madras, however, as Commander-in-Chief of Fort Saint George, exercises the power of ordering certain works within the Fort, without the intervention of the Board, as will be stated more particularly below.

nature to an amount not exceeding *Rs.* 500; but in the case of commissariat buildings and storehouses, there is in emergent cases no money limit to their power to order repairs.

The local agency under the Board.

175. The local agency at the command of the Board in this department is as follows:—There is a Superintending Engineer for the Presidency Division, with an assistant; and a Superintending Engineer in each of the Mysore, Hydrabad, Nagpore, and Saugor and Mhow Divisions. In the last named there are likewise four executive officers;* viz. one to each of the four circles into which that division is subdivided; and in the Hydrabad Division the executive duties at Jaulnah are entrusted to the local cantonment staff officer, who corresponds direct with the Board, and is hardly in any respect under the Superintending Engineer of the division. In the remaining five divisions there is no Superintending Engineer, or any officer permanently under the orders of the Board for the execution of work, the whole of the duties being executed by commanding and staff or other officers, as may be most convenient.

Mode of obtaining sanction for repairs.

176. We now proceed to describe the course of proceeding in the construction and repair of works, first in those divisions in which there are Superintending Engineers, and afterwards in those where there are none. The Superintending Engineers of Mysore,† Hydrabad, Nagpore and Saugor have professional charge within their divisions respectively, and under the general control of the Military Board of all military and public buildings, all fortifications, and all bridges and drains within military cantonments. The charge and custody of all buildings remain with the office, corps or department in occupation thereof, and when vacant it devolves on the staff officer, or the Quartermaster-general's Department, or the commanding officer.

Formerly, committees were assembled annually to examine all public buildings, and report what repairs they required; but this system was abolished in 1830, and the officers and departments respectively in charge or occupation of buildings are at present required to report to the proper authority when any repair is wanted. At stations in the interior, this report is made to the officer commanding the Division, who after causing a statement of the requisite repairs to be made by the Superintending Engineer's Department, may immediately, and without the previous sanction of higher authority, direct the execution of both emergent and petty repairs; the limit being that the outlay shall not exceed *Rs.* 50 for petty repairs, to any single building in the half-year, and *Rs.* 500 for each emergent work. In the case of more extensive repairs not emergent, a report is submitted by the commanding officer to the Quarter-Master General of the army, by whom it is laid before the Military Board; the Board call for plans and estimates, and if the amount of the estimate does not exceed *Rs.* 500, they have power at once to authorize the works, the circumstance being merely notified for the information of Government; but if above *Rs.* 500, the previous sanction of Government must be obtained before execution can be ordered.

And for new works.

177. When new works, extensions, improvements and alterations are required in the Military Department, the officer commanding the division represents the necessity for the work through the Quartermaster-general, to the Commander-in-Chief; and if approved by him, the application is forwarded to Government, and for similar work in other Departments under the Military Board, application must in like manner be submitted to Government through the head of the Department. Thus, for all Marine buildings at the Presidency, the channel of application is from the Marine Board to Government; for buildings connected with Her Majesty's Supreme Court or with the Police, applications are submitted by the Judges and Superintendents

* The executive duties of the Saugor circle have lately been laid upon the Superintending Engineer, an arrangement which cannot be beneficial to the public service, as it combines controlling and executive duties in one and the same officer, and also because it leaves him very little time for the important duty of controlling the young and comparatively inexperienced executive officers. In consequence of this amalgamation of duties, one of the four executive officers has been dispensed with.

† The Superintending Engineer of the Mysore Division has also the control of all the roads and bridges, and all irrigation works throughout the Mysore country, being 28,000 square miles in extent; but as respects those works, he is not subordinate to the Military Board, but to the Commissioner of Mysore and the Governor general. It is superfluous to add that the services of a single officer over so extensive a country, though valuable for the professional advice and counsel which he is able to afford, must be little more than nominal, except in very rare instances, in the way of real superintendence or inspection.

Superintendents of Police, and for Ecclesiastical buildings by the Bishop. The Government, if they concur in the necessity or expediency of the work proposed, either direct the Military Board to submit a plan and estimate for it, or merely call for their opinion; but in every case, whether their opinion be called for or not, it is the duty and practice of the Board to state any objections to the work that may occur to them. If the Board object to the work, they state their opinion without calling for estimates; if they see no objection, they call for plans and estimates from the Superintending Engineer, and submit the same to Government, with their remarks. Until lately, the custom had gradually crept in for the commanding-officer to obtain from the Superintending Engineer a plan and estimate for the proposed work, and submit them at once to the Commander-in-Chief, through the Quartermaster general, with his application; but this objectionable practice, involving the preparation of numerous plans and estimates for works which after all were never sanctioned, has been constantly discouraged by Government; and by a recent decision of the Honourable Court, the practice of calling for plans and estimates, except through the Military Board, has been prohibited.

Mode of executing work.

178. The course followed in executing works is the same in all the foregoing cases; except that the more important works receive a larger amount of the attention of the Superintending Engineer than the smaller ones. The execution of works on contract is in extremely limited use in the up-country stations, because very few men of respectability, capital and skill, can be found to take contracts; and because it is found that work in course of execution by contract requires fully as much careful superintendence as that done by the direct agency of the department. It is very much the practice, however, to obtain supplies of building materials by contract, because there is there less opening for fraud.

At stations in the interior.

179. When a Superintending Engineer receives instructions for the execution of a work, the Paymaster is at the same time directed to supply him with the necessary funds, in accordance with established rules, which will be more fully noticed hereafter in speaking of the accounts of the department. The advance as drawn from the Paymaster is generally paid over without delay for materials contracted for or received, or for work done. In the case of works at the head-quarters of a division or station, the workpeople are in some cases paid once a week at the office of the Superintending Engineer, while in others the payment is left entirely to the head Conicopillay; at out-stations the workpeople are paid by the subordinate Overseer or Conicopillay in charge of the work. The price of materials is for the most part paid at the head-quarter station, through the head native servant of the Superintending Engineer establishment, in presence of the European serjeant; at out-stations it is paid by the servant in charge of the work. The Superintending Engineer receives daily reports of work performed and materials expended on works at the head-quarter station; and from out-stations he receives a daily, or weekly or monthly report. While a work is in course of execution, monthly progress reports in detail are sent to the Military Board, and after the work is completed, a survey is held by a committee, when professional officers can be obtained under the order of the officer commanding the division, and they make a report in a prescribed form, certifying that the work is in accordance with the plan and estimate, and of good materials and workmanship. But when a professional committee cannot be assembled, then the officer commanding, or the head of the department for whose use the building is intended, inspects the work during its progress, granting a certificate at each of the four stages at which the work when in progress is inspected. After the accounts of the work are finally closed, the bill is prepared from the daily accounts and submitted. If it exceeds the estimate, explanation of the cause is sent with it: and if it falls below the amount drawn as advance, the difference is repaid to the Paymaster, and his receipt accompanies the bill, as also the survey report or the certificates. The bill is sent to the Chief Engineer, the despatch being at the same time notified to the Board; the Chief Engineer, after causing the bill to be examined in his office, reports upon it to the Board, and it is then disposed of, either immediately, if correct and according to rule, or after explanation by the Executive Officer if it should be in excess of the estimate, or otherwise open to objection. It is either finally sanctioned by the Board if within the power vested in them, or submitted for the sanction of Government.

The course of proceeding at the Presidency.

180. At the Presidency, the course of proceeding is somewhat different. In the first place there is no officer commanding the Presidency Division, and no one therefore to exercise the powers in connexion with the Public Works Department, which in the interior devolve on such an officer. Again, a large portion of the buildings at the Presidency belong to Civil Departments, and in respect to them also there is no one having similar powers. From both these causes it comes to pass that much detail is thrown upon the Board in connexion with the works of the Presidency Division, which hampers their proceedings, and from which it is desirable to relieve them. Again, the fact that the Governor for the time being is Commander-in-Chief of Fort St. George modifies the operation of the system. In virtue of his holding that office, no work can be done, and no alteration made, to any building within the fort, Civil or Military, or to any military building outside the fort, in the occupation of the troops forming a part of the garrison, without the previous consent of the Governor; and all applications, either for new works or for repairs, must first be made to him. His Excellency holds the power of authorising repairs to any of the buildings above described, to the amount of 200 rupees without estimates; he also authorises new works or improvements to the same amount, on estimate; the orders both to prepare the estimate and to execute the work, are generally sent direct to the Superintending Engineer, through the Town Major, without the intervention of the Military Board. In case of works of larger magnitude, the estimate after being received from the Superintending Engineer by the Town Major, is sent by the latter officer to the Military Board, who dispose of it in the usual order.

At the Presidency, the Barrack-master has charge of all Government buildings when vacant. When they are in occupation, any occasion for repair is reported to him, and he inspects the building and certifies the facts as he finds them. His report to this effect goes, in the case of the buildings inside the fort or belonging to the garrison, to the Town Major, for the information of his Excellency the Governor; and in the case of other buildings to the Military Board. And the necessary orders are thereupon issued to the Superintending Engineer to prepare estimates for the work required.

As respects the execution of works, the course followed at the Presidency, is for the most part the same as at the stations in the interior, with the difference that contracts are more generally in use. The work of the division being so much heavier than in any of the up-country divisions, the Superintending Engineer has an assistant who is a commissioned officer, as well as several European Overseers, and a larger establishment of inferior servants.

The Superintending Engineer is wholly an executive officer.

181. It will be seen from the foregoing detail that the duties of the Superintending Engineer are wholly executive; for though at the subordinate stations of the up-country divisions, the work is not done under the Engineer's own eye, yet it is done by his establishments, on his responsibility, and under his direction and control. And this executive department is without any sufficient control by an inspecting department. At the Presidency indeed the duty of inspecting the work done by the Superintending Engineer is laid on the Chief Engineer, but the latter officer has besides, three separate offices to attend to; viz., his own, the department of Public Works of the Revenue Board and the Military Board; and it is therefore impossible that he should give much time to this additional duty. A Maistry of his establishment is probably sent to look at a work executed by the Superintending Engineer Department; but except this objectionable kind of inspection, there is practically no direct inspecting department at the Presidency; while many of those functions which would properly be discharged by an inspecting office now devolve on the Military Board, and encumber it with details not properly appertaining to an office of general control. In the interior the inspecting office is still more emphatically wanting, there is not even the pretence of it; and the result there also is, that many little details fall on the Board. We cannot but regard this absence of inspection as a material defect in the structure of the department; we have given our careful attention to the means by which it can be removed, and shall bring forward suggestions for this object.

The department in the Saugor Division.

182. When the Saugor Division was recently transferred to this Presidency an effort was made by the Military Board to organize the Engineer Department on a different principle from that which obtains at Madras, and in accordance with the Bengal and Bombay systems, viz., Superintending or Inspecting Department separate

separate from the executive. But from the first, the Superintending Engineer appears to have been intended by Government to be an executive officer, like the other Superintending Engineers. But the Saugor territories are very extensive (having an area of above 29,500 square miles), and besides the work of a number of military stations, there are also extensive works constantly in progress on the roads, and in the Holkar and Bhopal States. It was therefore found necessary to sub-divide this division into four circles, to each of which an executive Engineer was at first appointed; and upon the recommendation of the Military Board the Government were induced to consent that the Superintending Engineer should cease to be himself executive, and confine himself to the proper duties of an inspecting officer; that is, projecting works, or considering projects proposed by others, making or revising estimates, aiding the executive officers with his professional advice on works while in progress, inspecting work done, and checking and examining bills. This system commends itself to approval, both because it secures that check and oversight by an independent officer so valuable as a stimulus to activity, and as a check to malversation, and also because it effects the best possible division of duties, by giving youthful zeal and activity to the execution of work, and at the same time placing young officers in a position to gain instruction from more practised and experienced minds; and securing experience and practical skill, combined with direction and control. Practically this has been found to succeed extremely well; but by recent orders from Government this division of duty and labour has been altered, and the Superintending Engineer has again become an executive officer.

No Engineer Officers under the Military Board within the Provinces.

183. In the remaining five military divisions, viz. the Northern, Centre and Southern, the Ceded Districts, and Malabar and Canara, comprising the whole of the Honourable Company's own territory under the government of Fort St. George, there are no Superintending or other Engineer officers allowed as a fixed establishment for the works under the Military Board. Up to 1838 there was a Superintending Engineer on the staff of every division; but we have already detailed in an early part of this report, the circumstances which led to the substitution of Civil Engineers for Superintending Engineers in all the divisions of the army within the frontier, viz., that the duties of the latter were extremely light and unimportant, as compared with those of the Civil Engineers, who were overwhelmed with a pressure of business far beyond the power of any man to accomplish.

The existing system described.

In 1838 accordingly, the appointment of Superintending Engineer was abolished in the five divisions within the frontier, and the number of Civil Engineers was increased from four to eight, with divisions correspondingly contracted in extent. The Civil Engineers were vested with the professional charge of the Revenue, Civil and Judicial buildings, *i. e.*, with the duty of making estimates for their repair or construction; while the custody of Military buildings, formerly devolving on the Superintending Engineers, was transferred to the Staff Officers of stations; and part of the establishments previously belonging to the Superintending Engineer's Office, were placed under the orders of the Staff Officer of the Quartermaster-general's department, to assist, under the orders of the Military Board, in preparing plans and estimates and executing works. With respect to the remaining part of the duty of the Superintending Engineer, viz., estimating for and inspecting the construction and repair of military buildings, it was directed that all ordinary repairs and new works within a certain cost, should be estimated for and executed by the Staff Officer; the Civil Engineer affording his professional advice in all more considerable works, or when called to do so, but being exempted from all executive duties.

The change has been a gain on the whole;

184. It cannot be denied that this change was very beneficial to the public service generally. It materially added to the strength of a most important department, far too weak indeed, even with that addition, for the arduous duties laid upon it; and while it weakened a department involving the expenditure of only a few thousands of rupees, it strengthened one charge with the expenditure of lacs. And though in the military branch much inconvenience and some loss were experienced, yet the gain to the country by the increased and more effective supervision in the Civil Department, vastly overbalanced that evil. This was allowed even by the Military Board themselves. They disapproved of the change, which greatly diminished their power and exposed them to difficulty in carrying on their work; but even while strongly representing these evils to the Govern-

ment, and urgently pressing them to apply a remedy, they yet with honourable candour fully admitted that the change had on the whole been greatly to the advantage of the public service. They believed the arrangement, to use their own words, "to be the most beneficial and advantageous for the public service at large, during the existing scarcity of Engineer Officers;" but they represented that the department of buildings and repairs was seriously crippled by it, and they recommended as a remedy, either that the number of Engineer Officers should be considerably increased, or that a Barrack-master or Executive Officer with a suitable salary, should be appointed to each division. Neither of these suggestions was adopted, nor was any other remedy applied; and in consequence the Military Board have ever since been much hampered and inconvenienced in the repair and construction of military buildings within the frontier; and great delay, unauthorized and injudicious deviations from plans, and excessive cost, have in numerous instances been the results. In several such cases the Military Board, and in others, individual officers in charge of works, have incurred the severe animadversion of the Government and of the Court of Directors; while the parties thus blamed, especially the Board, were in no degree culpable; the fault being in the system, which the Government had neglected to amend, and which the Board were working as well as its radical defects admitted.

But it has much hampered the Military Department.

Practical evils of the present system.

185. Under the order of 1838, the Staff Officer of the station is charged with all the duties of Executive Engineer; but as a general rule, that officer is wholly ignorant of business of that nature. And he has moreover other duties to attend to, which although they do not occupy the whole of his time, yet being immediately those of his office and for which he is paid, receive the principal part of his attention; and lastly, he in some instances holds office only while his regiment is at the station, and is therefore liable to be ordered away at any time, and in fact frequently is so while in the middle of a work. The natural consequence is, that the work of the department is wholly managed by the subordinates of the office; who are under no responsibility, being shielded by that of their ostensible head. This being the state of matters at considerable military stations, such as Trichinopoly, Palamcottah, Cannanore and Mangalore, where there are the head-quarters of one or more regiments, and a Staff Officer, smaller stations occupied by detachments only, are still worse off. At such posts the officer commanding the detachment is charged with the execution of any works required; and as the detachments are relieved every six months, the smallest work probably changes hands at least once; and more considerable operations are often under the ostensible superintendence of four or five different officers, all equally unacquainted with the sort of work, and often very youthful and wholly unequal to a contest with the knavery or chicanery of native trades people or contractors, or of their own ill paid native subordinates.

An example of their operation.

186. As an instance in point, we may quote the case of the Ramnad Sepoy barracks. These buildings, estimated to cost 3,675 rupees, were ordered to be executed in 1847. In 1848 the young officer commanding the detachment at that place received an advance of 900 rupees, which he paid over to contractors for materials to be supplied; but before any materials were delivered, this officer was relieved by another equally inexperienced; the latter found it impossible to induce the contractor to fulfil his engagements; he appears even to have maintained that as his contract was made with the first officer, he had nothing to do with the second, and at the same time he could not be persuaded to take the proper steps to get the contract deed transferred to the name of the latter. Ultimately, after multiplied vexations and delays, the First Assistant Civil Engineer of the division was placed in charge of this trifling work; he has been engaged on it already for many months, and it will probably still engage him for several months more. Thus the plan adopted in this case for rectifying the evils of the new system, was simply a return to those for which the old one was abrogated; one of the two Engineer officers charged with the direction and control of the Maramut expenditure in a division containing 16,400 square miles, and with the professional care of the many thousands of irrigation works and all the roads within it, was withdrawn for nearly two working seasons from these important functions, in order to superintend the construction of a small and simple building, the necessary superintendence of which might have been performed fully as well, at one-fifth of the cost, by an intelligent European Overseer, or by a qualified officer selected from the line, with a small staff allowance. In the course of last year, a rule was passed by Government, on the recommendation of the Military Board, empowering them

to

to assign to officers placed in charge of the execution of work, an allowance of two or four rupees a day, according to the nature and magnitude of the work. This arrangement, whilst operating to some extent in correcting the evils proceeding from the want of an executive, does nothing towards providing the Board with the necessary permanent professional assistance; and even this is not made the most of, as the choice of the individual to be employed is restricted to the officers at the station, instead of being made from a list of officers previously examined, and pronounced qualified for engineering duties.

Table of advances and of officers responsible for them.

187. The following Table shows how large a number of officers of different branches have stood in the public accounts during the last four years, as having received public money for the execution of works under the Military Board, with the amounts standing against each. The amount of disbursements under "Officers of other branches" is comparatively small, but these officers being constantly changed, and being generally entirely unacquainted with the business of keeping accounts and executing works, and destitute of that kind of knowledge which can only be acquired by departmental organization, the controlling duties of the Board are increased and complicated under the present system to a great degree. Under a good system, instead of 76 officers having accounts open with the Board, and those requiring to be instructed in every part of their duty, there would be only five or six well qualified officers. The difference in the labours of the Board and in correspondence, as well as in the efficiency of the work, would be very great. In reporting on the accounts of the department, we shall propose measures to remedy the evils which we have here pointed out.

	Advances outstanding on the 1st May											
	1848.			1849.			1850.			1851.		
	No.	*Rs.*	*a. p.*	*No.*	*Rs.*	*a. p.*	*No.*	*Rs.*	*a. p.*	*No.*	*Rs.*	*a. p.*
Engineer Officers -	13	4,49,210	11 –	16	4,35,063	12 3	13	3,12,192	15 10	16	3,27,337	2 10
Officers employed as Engineers drawing pay.	2	2,428	12 4	–	-	- -	2	8,491	3 1	4	66,730	4 –
Contractors - -	5	75,140	15 9	6	56,434	7 –	9	81,737	9 10	9	86,922	– 2
Officers of other branches drawing no pay.	76	42,604	1 5	65	49,207	11 10	68	62,221	2 4	69	48,653	– 7
TOTAL - - -	96	5,69,384	8 6	87	5,40,705	15 1	92	4,64,642	15 1	89	5,29,642	7 7

The subordinates in the Military Department.

188. The subordinates by whom the Superintending Engineers are aided in their work are of the following grades; 1st. Overseer Serjeants, whose duty it is to visit works in progress during working hours, and muster the men, as a check on the Conicopillay; 2d. an Office Writer, or Manager, for correspondence, accounts, &c.; 3d., a Draftsman, who draws plans, both fair for submission to the Military Board, and rough for the guidance of the Maistries; 4th., Conicopillays, who are partly accountants and partly overseers, some of them being employed exclusively in the office of the Superintending Engineer, calculating estimates, preparing bills, drawing up the periodical reports, &c., whilst others visit the works in execution, muster the labourers, check the receipt of materials and keep an account of them; and also in some cases (especially in the case of works at a distance from the head-quarter stations), pay the wages of the labourers, and the cost of materials. 5th., Maistries, that is, headmen of bricklayers, carpenters, &c., whose immediate duty is to superintend works in progress. The Executive Officers in the Saugor Division have subordinates of corresponding classes, though in some instances called by different names; and they have also one or more European Overseers, who are employed in the superintendence of considerable works. In the five divisions within the frontier where there are no Superintending Engineers, there are still smaller establishments attached to the office of the Staff Officer of the principal station, and consisting generally of a Draftsman, one or two Conicopillays, and two or three Peons.

Their qualifications.

189. The qualifications of these several classes may be comprised generally, under the description we have already given of the corresponding classes in the Civil Department. Some officers indeed express themselves satisfied with the character and abilities of their native subordinates; but these are cases where the work of the department is very small, and confined to one station only, so as to be immediately under the eye of the officer. Where the work of the department is larger and more scattered, so as to make it necessary to trust more to the skill of the subordinates, and to confide to them pecuniary responsibility, they are stated to be unworthy of trust and wanting in skill and intelligence, for want of any previous training or instruction; and it is often very difficult to find competent parties to fill vacancies. We may add that their pay is very small, and requires to be raised, and to this point, as well as to the provision of means of instruction, we shall have to revert hereafter.

The European Overseers.

The European Overseers employed, as already said, in the Saugor Division, are fully as well reported of by their superiors as those employed in the Maramut and Road Departments, of whom we have already spoken. They are described as being skilful, energetic and trustworthy; and it is stated that in works executed under their superintendence, a considerable saving is often effected even where more work is done than the estimate provides for, whereas such a result is very rare in the case of estimates framed on the very same data, but executed by natives, the cause assigned being partly ignorance and laziness in the application of labour, and partly peculation.

Roads and bridges in military cantonments.

190. The construction and maintenance of roads and bridges in military cantonments is under the control of the Military Board, as already said; at division head-quarters the work is usually performed by the Quartermaster-general of the division staff, under the orders of the Board, and at other stations by the station Staff Officer. We would not disturb this arrangement. A small establishment, consisting of a Road Serjeant, &c. &c., is kept up for the work, and the Lascars and bullocks of the Commissariat Department, and in some cases civil convicts, are employed in the work. The amount directly contributed by the Government for the maintenance of these roads is not large, but it is the practice in most cantonments to devote to this object all the fines levied at the Military Police Office, and at some stations beyond the frontier, where there is a considerable extent of cultivated land within the cantonment limits, the Government revenue of such land is laid out on the roads without being brought to account. An order has also been lately passed by the Government, making the grazing rent obtained for the Glacis and Esplanade of Fort St. George available for the repair and maintenance of the railings, &c., and of the Esplanade Roads; and this order is construed to extend to up-country stations also.

Their maintenance how to be provided for.

191. It appears to us very objectionable that the amount available for local improvements should depend on the sum that is levied in the way of fines at the police office; the practice seems to be one very much open to abuse, and we beg to recommend that it shall be everywhere put a stop to. As respects the other funds above referred to, they may properly be made locally available. The plan of allowing a certain sum annually for the maintenance of roads has been approved by the Government and the Honourable Court; it has been introduced in some cantonments, and we think it should be adopted in all. We would propose that in every cantonment certain roads should be fixed to be maintained at the Government charge; that a mileage allowance for them should be settled with reference to the peculiar circumstances of the station; and that from the total at each place a deduction should be made, equivalent to the probable yearly amount of the funds from local sources other than fines, taken at a low estimate so as to be on the liberal side. Even if these miscellaneous sources of income are given up for local disposal as we propose, it seems expedient that the accounts of receipts and disbursements of such funds should be subjected to regular audit by some authority, no less than the expenditure from the mileage allowance.

Where Government servants are employed on the cantonment roads, their services should be paid for.

192. In many cantonments it is the practice to employ Lascars, bearers, and other public followers, being Government servants, on the station roads, when not otherwise engaged. This system appears to us objectionable and open to abuse; under it the real amount paid by Government for the roads is never known; and we believe, that if it were abolished, it would be found practicable to reduce the establishments at many stations. We beg to recommend, therefore, that either the

the practice should be absolutely prohibited; or that whenever Lascars or other Government servants are so employed, whether for whole days or parts of days, their labour shall be paid for out of the road allowance, at the rate of the Government pay which they respectively receive; the amount to be received by the Paymaster, and placed to the credit of the Government, in diminution of the charges of the department to which the servants so employed belong.

Tools and assistance obtained from the Government arsenals and workshops should also be paid for.

At some stations, again, a certain number of carts are allowed at the cost of Government for the maintenance of the roads; and all tools required for the same purpose, pickaxes, momaties, jumpers, baskets, &c., are supplied from the Government stores as required, and all repairs required to the carts are in the same way performed at the Government workshops without any charge. This practice likewise appears to us a bad one. Independently of the fact, that here again the Government is put to a constant expense for the roads, of which the amount is never brought to notice, the inevitable tendency of the system is to promote extravagance and waste. It would be contrary to all experience to suppose that where implements are obtained for nothing, they will be taken as good care of as if they had to be paid for out of a limited fund. We think that the practice should be discontinued as regards both the supply of carts, their repair, and the tools; that, in short, the aid given by Government to the maintenance of the Cantonment roads should be restricted to a money allowance. Where tools are required from the Government stores, we recommend that they should be supplied, if convenient, but only on payment in cash. This is already the practice in the Engineer Department and in the Road Department, and we think it should be made universal. It simplifies the accounts, affords the Government a correct knowledge of its expenditure, and tends to promote economy.

Some changes proposed in the military branch of the department.

193. The military branch of the Public Works Department will share in the improvements to be made in the department generally; especially in the advantages of an establishment, more efficient, both as to numbers and qualifications. But we have to propose some changes in the structure and internal arrangements of the military branch itself; these we may conveniently detail in this place, and we will begin with the Presidency.

We have already remarked, that the duties of the Superintending Engineer under this Presidency are purely executive; and this is eminently the case at the Presidency itself. And from the absence of any department for inspection or superintendence, and the non-existence, already noticed, of any officer to perform at the Presidency the functions which, in the interior, are discharged for the Civil and the Military works respectively, by the Collectors and the General Officers of Divisions, much local detail is thrown upon the Board, which is unsuitable to its position of general control, which hampers its discharge of such general functions, and which, after all, it cannot perform satisfactorily.

In the duties required of the Chief Engineer, there are similar anomalies, partly produced by the same absence of an Inspecting Department, and equally inconsistent with his position.

A detail of the merely local duties now imposed on the Military Board.

194. We must explain our meaning in detail, and we will begin with the Board. The local duties now imposed on the Board, and from which, in our opinion, it ought certainly to be relieved, are as follows:—

1st. Inviting, receiving, and deciding on all tenders for doing work by contract at the Presidency. We have already said that a large part of the work at the Presidency is done by contract;* with every endeavour to secure fairness in the competition for contracts, and the decision on tenders, it is found practically impossible to shut out intrigue. If the management of contracts rested with the Executive Officer, matters would be very much worse, as the people of his department are as a matter of course opposed to all contracts; under existing circumstances it is therefore necessarily in the hands of the Military Board; but the result is that their own people are mixed up in the contract transactions, and all effective appeal is cut off.

2d. From there being no Inspecting Department, the duty of inspecting all work done in the Presidency Division is imposed by the Regulations on the Military

* In our Second Report we shall offer some remarks on the system of executing work by contract with reference both to the Presidency and to the Interior.

Military Board; and this, it must be remembered, though the Board has very rarely contained any professional member, except the Chief Engineer, *ex officio*. As a consequence, the Board have almost invariably devolved the duty of inspection on the Chief Engineer; but its performance by this latter officer is only nominal in the great majority of cases, and practically it may be said that there is no inspection at all. As respects works done by contract, the Government have lately, on the recommendation of the Military Board, authorized the Superintending Engineer to inspect works done by contract, on the ground that he had no concern with the execution. But this is hardly true as a fact, because such work is performed under the direction and supervision of the Superintending Engineer; and the arrangement seems further objectionable, because the Superintending Engineer's office servants, as already said, have a personal interest in opposing all contracts, and discountenancing and discouraging all contractors.

3d. The duty of authorizing repairs to individual buildings, which in the interior, is the part of the Generals of Division, falls at the Presidency upon the Board, for all buildings, civil as well as military, except repairs under 200 rupees to buildings within the fort, or belonging to the garrison. The buildings within the Presidency Division are 622 in number; and it may easily be conceived how great a mass of petty details must be involved in considering and disposing of every case of the most trifling repair to this large number of buildings of so many kinds.

4th. Another function nearly allied to the last mentioned, is that of ordering the necessary advances of money, in the case both of repairs and of new works and improvements. Under the existing rules for making advances, the Board are charged with a great deal of minute details as respects works at up-country stations as well as at the Presidency; this inconvenience exists in a greater degree, indeed, at the Presidency, from the absence of an officer vested with power to order advances in the case of small works, but it is not wholly owing to that cause. In our second Report, on the accounts of the department, we hope to be able to propose a plan which will relieve the Board every where from all connexion with the detail of sanctioning advances for works; but, in order to effect that separation at the Presidency, it will be necessary to have an officer to perform the duty.

5th. Another purely local duty imposed on the Military Board is that of opening the bars of the Cooum and Adayar Rivers in due time. The former has always been under the Board's charge, the latter was so placed only last year. This is not only a local duty, but it is one which a Board, from its very nature, cannot really perform. It must of necessity do it by deputy; and it appears the wiser course to invest the officer who must be the Board's deputy with the direct charge, and a direct responsibility for the performance of it, and to leave the Board in its proper position of control. The duty and responsibility should, in our opinion, be laid on the Inspecting Engineer.

6th. There is still another duty of detail from which we think the Board ought to be relieved, and which we will mention here, though it is not of a local character. It is that of allotting tools and implements to the Engineering Departments. This is not a duty for a controlling office; it appears to us that it ought to be transferred to the Chief Engineer.

The Controlling Board ought to be relieved from all such.

195. From all the details above described, and from any similar which we may have omitted to notice, the Board of Public Works should be relieved. Some of the duties, we have seen, cannot really be performed by the Board, and it is obliged to do them by deputy, others are such in their nature as to require to be exercised under independent control; but all control and appeal are lost, when the Controlling Board itself does the act and so becomes concerned to uphold it. Of all it may truly be said that they embarrass the Board with details which it cannot duly attend to; and if even the Military Board has found itself hampered and impeded thereby, how much more will this be the case with the proposed Board of Works, with so much more extensive duties? It it a sound principle that a controlling office should not be mixed up with local matters; should have no more concern with details on the spot than in the most distant part of its charge. In most departments this rule is rigidly observed, and the Public Works Department ought by no means to be an exception.

196. The

196. The following is a brief summary of the separate duties of the Chief Engineer in connexion with the Public Works Department :— A summary of the duties of the Chief Engineer in connexion with the Public Works Department.

1st. He has charge of the Glacis and Esplanade, and it is his duty to prevent encroachments on either; he also collects and pays in the grazing rent.

2d. He has charge of the mines under the Glacis and Esplanade.

3d. All alterations in the fortifications are first submitted to him.

4th. Up to a very recent period all repairs to the fortifications were executed by the Chief Engineer; now they are done by the Superintending Engineer, but chiefly by contractors under him.

5th. The Chief Engineer has the general control of all the fortifications throughout the country; the local Engineer Officers in charge of them report to him.

6th. He has charge of the waterworks for the supply of the fort, and collects the water payment.

7th. As the delegate of the Military Board, he has the inspection of all work done by the Superintending Engineer's Department, except contract work.

8th. In the case of contract works, all the necessary plans, elevations and sections are to be prepared by the Chief Engineer, who is also to prepare the samples of materials, to be exhibited to contractors.

9th. He is the Inspector of the Government roads at the Presidency.

10th. He has the direction of the operations at the Paumben Channel.

11th. He directs the annual practice and experiments of the Sappers and Miners.

12th. All the estimates and bills of the Military Department are examined and calculated in the office of the Chief Engineer.

13th. He regulates the supply of instruments and stationery to the Engineer Officers in the Military Department.

14th. The lithographic press is in his office.

15th. He is in charge of the Surveyor-general's Department.

16th. The data and price lists of all the stations in the Military Department are recorded in his office.

17th. He has charge of all plans and maps in the Military Department.

18th. He is required to report his opinion in writing on all projects whatever in the Military Department, and on new projects in the Revenue Department, when he considers it necessary to do so.

197. It will be observed, that several of the items in the foregoing list are entirely of a local character, some being such as to require a great deal of time, while others are of trifling importance. We think that the Chief Engineer should be relieved from all such, and that they should be entrusted to local officers, leaving him at liberty for his general duties. The immediate charge of the fortifications of Fort St. George, of the Glacis, Esplanade and mines, and of the waterworks, would properly vest in the Inspecting Engineer of the Presidency, as would also the inspection of all the work performed by the Executive Engineer, and to the Government roads. He ought to be relieved from mere local duties.

The Chief Engineer should have the general control of the fortifications, not only of Fort St. George, but of all the forts in the Presidency, and should be connected with them all in the same way; not in immediate charge, but as the controlling head to whom all the local Engineers in immediate charge should make report, and with full power to visit all when on the spot. There are five fortresses besides Fort St. George, viz., Bellary, Bangalore, Vellore, Cannanore and Paulghaut. It might be well to require that all, including Fort St. George, should be annually reported on to the Chief Engineer by the Inspecting Engineers of the divisions in which they are respectively situated, and that the Chief Engineer should make an annual report on the whole to the Honourable Court of Directors. All alterations in the fortifications of Fort St. George should still be submitted to him, and the same as to all the other forts; but the channel should be the same in all these cases, viz., the Inspecting Engineer of the division. At present

present an annual committee, composed of the Chief Engineer, the Commandant of Artillery and the Quartermaster-general, assembles to consider any alterations required in the fortifications of Fort St. George; this might still continue.

As for the operations at Paumben, no reason is apparent why the charge of these should be in the hands of the Chief Engineer more than of any other purely local undertaking in the Provinces. We are of opinion that they should henceforward be under the direction of the local Engineer Officer, like any other works in his division, and under the general control of the Board of Works.

The general duties which he will retain.

198. By the arrangement now proposed, the Chief Engineer will be relieved from all immediate connexion with mere local matters. The duties which will remain to him out of the foregoing list will be as follow:—

1st. The general control of all fortifications throughout the country; to receive annual reports on them from the local engineers, and to make an annual report on them himself to the Honourable Court.

2d. To record his opinion in writing on any new project of any kind coming before the Board of Public Works whenever he may consider it necessary to do so, independently of giving his vote upon it as a member of the Board of Public Works.

3d. He will regulate the allotment of instruments and stationery to all Engineer Officers; and this also should be extended to all branches of the department.

4th. He will continue to direct the practice of the Sappers and Miners.

5th. He will still have charge of the department of the Surveyor-general.

6th. The duty of examining and reporting on the estimates and bills in the Military Department.

7th. And of recording the data and price lists of the same department.

8th. The maps and plans of the Military Department will still be deposited in his office; and the same might properly be the course with respect to the maps and plans of the whole of the Public Works Department.

Some other duties to be assigned to him.

199. And to these duties, we are of opinion that the following may properly be added:—

1st. In the data and price lists both of the Civil and the Military Department, but much more especially in the former, there is very great room for improvement. In the Civil Department, indeed, hardly any attempt has ever been made to systematise or arrange them, and we believe none at all to compare the rates and prices of contiguous districts.* There is much to be done therefore in this direction; and as the services of European Overseers come to be more extensively used in the execution of work, the very best materials will be procurable for constructing tables of prices and rates, as a guide in the future projecting and estimating of works, and in a degree in checking bills. Such tables can never be considered perfect, for every year, and almost every work, will furnish additional information, either for new localities, or in correction of former records of old localities; but still they are of no inconsiderable value. The collecting, recording, comparing and circulating the information thus obtained, will require constant care and attention; and it appears to us that the task may properly be assigned to the Chief Engineer.

2d. A kindred duty to the foregoing will be the examination of estimates and bills. At present this examination, as respects the fairness of rates and arithmetical correctness, is made in the office of the Chief Engineer, in the case of all estimates and bills before the Military Board. This course of proceeding has the advantage of relieving the office of the Controlling Board from a great mass of detail; it is found to work well in the Military Board, and

* In the Road Department, the late Superintendent had commenced to form a systematic register of the actual cost of the various parts of all works constructed; in the course of time this would have formed a valuable record of materials for constructing tables of data and prices.

and to prevent delay; and it may well be matter for consideration, hereafter, whether it will not be advisable to continue the practice under the new Board of Works, and to extend it to all branches of the department.

3d. We have seen that the allotment of tools and implements to the various Engineering Officers is a part of the duty of the Military Board. We think that it should be transferred to the Chief Engineer.

4th. When an efficient department of subordinates is organized, it will be essential to provide for fair promotion in it, and we conceive that this will be best ensured by a system of periodical reports as in the Ordnance Department. It appears to us also that the record of the services, qualifications and character of the members of the corps should be made and kept in the office of the Chief Engineer; and that he as the head of the Engineer Corps, is the officer to whom both the promotion, and the distribution and transfers, of the subordinates ought to be entrusted, subject to a certain amount of control on the part of the Board of Public Works and the Government.

We beg to recommend accordingly that the periodical reports on the qualifications and services of the subordinates should go to the Chief Engineer, and that on the occurrence of a vacancy, it should be the duty of that officer to recommend promotion to fill it. It should also be his duty to propose transfers and exchanges when they may appear to him to be necessary; but not so as to exclude the Board from the power of originating such proposals. We further propose that recommendations for promotion in and into the warrant grades should go through the Board of Public Works to Government for confirmation; and that those for promotion below those grades, should have the confirmation of the Board, to be given except on special cause to the contrary.

5th. So also with the commissioned grades; it appears to us expedient that the Board of Public Works should have the recognized power of bringing before Government (when they may think proper) the names of particular officers of the department for promotion to vacancies in it; and that in like manner the Chief Engineer should have the right to lay before the Board his opinion as to the arrangements to be so suggested to the Government. For the transfers of the higher grades, needing the confirmation of Government, the recommendation should go through the same channel; for those of the lower the Chief Engineer should recommend for the approval and confirmation of the Board.

6th. The only other function which we have to recommend for the Chief Engineer is, that of visitor of the College of Engineering, which we shall propose hereafter. It is important that such an institution should have a channel provided by which its wants and defects, and the means of improving it, may be brought weightily to the notice of the Government; and it seems to us that such a channel will be best obtained by constituting the Chief Engineer the visitor of the College; his reports upon it to go through the Board of Public Works.

The Presidency Superintending Engineer to be made an Inspecting Engineer.

200. It is certain that the new Board of Public Works with its very much larger duties, will be quite unable to perform the local duties now anomalously discharged by the Military Board. And there is no other office existing competent to assume them; the Chief Engineer, as we have already observed, does not discharge effectively the local duties imposed upon him; under the new arrangements he will have many new and large general duties, and the duties from which it is necessary to relieve the Board, cannot be imposed on him with any possibility of their real and effective performance. In order to provide for the discharge of these duties of local control and supervision, it appears to us very expedient to modify the Presidency Establishment by changing the Superintending Engineer into an inspecting Engineer; to have an Executive Officer under him, with a good establishment of subordinates, for the performance of simply executive duties. The Inspecting Engineer will be charged with the duty of inviting, receiving and deciding on tenders for doing work on contract, as well as preparing plans and samples of materials, and he will have the inspection of all works, whether done by contract or by the Executive Department, as well as of all work on the Government Roads at the Presidency. He will also, on the suggestion offered above, have the duty of authorising petty repairs to buildings, and ordering advances for works to be

With an Executive Officer and distinct establishment.

be done in the Presidency Division, under rules to be stated hereafter; he will be charged with the duty of opening the Cooum and Adayar bars in due time; he will have the immediate charge of the fortifications, the Glacis and Esplanade, the mines and the waterworks; and, lastly, it seems desirable that the lithographic press, if maintained at all, should be transferred to his charge. There may still be some duties proper to be committed to the Inspecting Engineer we have omitted to notice.

But the number of officers in the Division will need no increase.

201. It does not appear likely that the arrangement now proposed will make it necessary to increase the number of commissioned officers at the Presidency, for though the Superintending Engineer at present has an assistant, yet we think that, with the aid of an efficient subordinate establishment, and especially with some European Overseers, the Executive Engineer will need no Commissioned Assistant, especially if the system of doing work by contract is extended, as we fully believe it may be with good effect when the departments are thus separated. But even if an assistant to the Executive Engineer should be found necessary, the total addition of cost will be very trifling. The number of Government buildings in the Presidency Division is 622, and their present value, as estimated in the books of the Military Board, exceeds 51 lacs of rupees, exclusively of the fortifications and of the works connected with them. And the whole cost of the establishment for the custody and maintenance will be a very small per-centage on this amount; it will be very moderate also with reference to the amount of work done in the division, which averages nearly *Rs.* 140,000 a year. The details of the salaries and establishments which we propose for this division will be shown in a future section.

Arrangement proposed for Mysore Division and Country.

202. Thus much of the changes to be made at the Presidency; in the interior also it is necessary to make a change in the position of the Superintending Engineers. There are now four Superintending Engineers away from the Presidency, viz., for the Military Divisions of Mysore, Hyderabad, Nagpore and Saugor. The Superintending Engineer of the Mysore Division is purely an Executive Officer as respects the works in the very large cantonment of Bangalore, and in the several subordinate military stations; but, as respects the whole Mysore country, he is also the Consulting Engineer of the Commissioner and of the four Superintendents of Revenue Divisions. Of course he can do little or nothing towards the direct management of the roads and irrigation works of a country 28,000 square miles in extent, especially burdened as he is with executive functions in the military stations, but to a certain extent he is able to give professional advice and counsel. The Mysore country has been for 22 years under direct administration by officers of the British Government, and it is likely to continue so. The same considerations which lead us to advocate a large increase of professional strength in the Company's own territory, make it equally necessary in Mysore. We propose to change the Superintending Engineer into an Inspecting Engineer, with one District Engineer for each of the four Revenue divisions or districts of the country, and an Executive Officer for the extensive cantonment of Bangalore.

Arrangement for the Saugor Division and territories.

203. The Superintending Engineer of the Saugor Division has a charge geographically still more extensive; it embraces the whole of the Saugor and Nerbudda territories, 29,504 square miles, including six small states within the territories and under management; and besides this, there are the cantonments and stations of Mhow, Indore and Bhopaul, and considerable lines of road within the territories of the Indore and Bhopaul States and in Bundelcund. There are large expenditures on some of the great lines of road, and all the buildings in the various stations require to be attended to; but we believe there are no Government works of irrigation. We have already said that the division is subdivided into four circles, of which the Superintending Engineer has immediate charge of one, while the other three are under the charge of the same number of Executive Engineers or Officers; but it is in contemplation to relieve the Superintending Engineer from all executive functions, and restore him to his proper position of general control. We propose that this arrangement shall be completed and made permanent; that each of the four subdivisions shall be under an Executive Officer, and that the title of the Superintending Engineer shall be changed to that of Inspecting Engineer.

Arrangement proposed for the Hyderabad and Nagpore Divisions.

204. The Superintending Engineers of the Hyderabad and Nagpore Divisions are simply Executive Officers, and there is no Inspecting Department. We propose

pose to abolish these two appointments, and to have in lieu an Executive Engineer at Hyderabad and at Nagpore; and we further propose that the Executive Engineer at Nagpore shall be under the Inspecting Engineer of the Saugor Division, and the Executive Engineer of Hyderabad under the Inspecting Engineer of the Third Division; which, as to be hereafter proposed by us, will comprise the districts of Masulipatam and Guntoor. It will rarely be necessary that these stations at Nagpore and Hyderabad should be visited by the Inspecting Engineers; but those officers will be the channel of communication between the Executive Engineers and the Board, and will relieve the latter from some detail. In consideration of the distance of these two stations from the inspecting authorities, and of the military position of the two subsidiary forces beyond the frontier, it seems expedient that these two Executive Officers shall always be from the Engineer Corps.

At present Jaulnah is not under the Superintending Engineer of Hyderabad, but is under the separate charge of the Staff Officer of the station, who corresponds direct with the Board. There is a good deal of work there, more indeed than at Hyderabad itself; and we recommend that it shall be made an out-station under the Executive Engineer of Hyderabad, and that a European subordinate of the department shall be stationed there. The foregoing arrangement will fully provide for all the duties to be done in these two divisions. Each of these two Executive Officers will occupy a sphere of duty much less important than that of a District Engineer within the Provinces or in Mysore, or of an Executive Officer in the Saugor Division.

The stations within the frontier.

205. With regard to the stations within the frontier, we do not propose much change of system; the rules of the 26th June 1846, which now regulate this part of the department, are good, and seem to require no alteration. The difference will be in a more efficient working of them, by means of better establishments. At the chief stations, Trichinopoly, Masulipatam, Vellore, Arcot, Bellary, the buildings will still remain under the charge of the Station Staff Officers, who will continue to execute the works required, under the same system of direction and control as at present. The establishments at those stations will share in the general improvement of the qualifications of all the subordinates in the department; and the local Engineer Officers will have much more time to spare to help the Staff Officers with professional advice, and to inspect the work. The Civil Engineers are required even at present to report on the state of the buildings at the military cantonments they may visit; but hereafter they will be able to do this much more systematically and fully. In short, all the duties of the Engineers being performed under the direction of one controlling body, every part of those duties will receive its due attention, and all will be made to harmonize and fit into each other, in the manner the most conducive to economy of time and labour.

So also of the work at the smaller stations, where there is no Staff Officer: it will often be possible to arrange for the execution of such work under the superintendence of a subordinate of the department, of suitable rank and qualifications; and it will probably be rarely necessary to employ on this duty young regimental officers wholly inexperienced in it, in the mode which we have instanced above in the case of Ramnad. The precise mode of executing work of this description will be spoken of more properly in connexion with the execution of work in the country generally, which will be treated of in our report on the accounts of the department.

Section V.

Proposal of a New Board of Public Works.

Order of treating the various subjects of Report.

206. Having thus detailed the existing state of the Public Works Department in all its branches, and the defects apparent in it, we now come to the consideration of the changes which we think expedient, in order to increase its efficiency. And in bringing forward our proposals to this end, we shall adopt the following order.

We shall first set forth our recommendations respecting the chief controlling authority, its constitution, and its duties.

We shall then proceed to consider the local or provincial parts of the Public Works Department. And in order to forming a judgment of the strength and organization proper for them, we shall examine into the work to be done as respects both irrigation works and communications; and shall state what appears to us a fitting scale of expenditure on each. We shall then be able to judge what quantity and what kinds of control and superintendence the execution of that work will require; and we shall discuss that question with reference to officers of all grades, commissioned and other, European and Native; stating also our views as to the best mode of providing and training a succession of such officers in the several grades.

Existing defects briefly recapitulated.

207. First then of the supreme controlling authority. In speaking of the Public Works Department of the Board of Revenue as it exists at present, we pointed out how much its business has increased of late years; and we observed that as the revenue members of the Board are much taken up with their revenue work, and as the Chief Engineer has two other offices to attend to, and his own proper office where he usually sits is at a distance from the Board's office, the whole labour of the Public Works Department of the Board, with a very large part of the responsibility, does in fact devolve on their Secretary, fortunately an able and indefatigable officer. We remarked, likewise, that this circumstance, and the constant pressure of matters of detail, have operated to prevent the Board from taking that large and comprehensive view of the wants and capabilities of the country in connexion with this department, which belongs to a controlling authority, and that they have not even collected any general or systematic information as to the condition of the existing irrigation works.

In reviewing the Road Department, we pointed out that the cause which led to the creation of that department under the late Government, was the failure of the Board of Revenue to give that degree of attention to the communications of the country which the Marquis of Tweeddale justly felt to be due to them; an omission, however, excused by the heavy pressure of the other duties of the Board, and by the discouragement with which all proposals for improving the roads had up to that time been received by the Government. We also pointed out the anomalous and false position of the Superintendent of Roads, constituted the controlling authority as respects the great roads, and required also to execute works over a very large extent of country; but yet left dependent for assistance, in those parts of his extensive charge where he could not be present himself, or detach either of his two assistants, on such aid as he could obtain from the Civil Engineers, who were in no degree under his orders, and who had their own proper work to attend to, and that more than enough to occupy all their time. And we showed how completely that department has failed, and from causes inherent in its constitution, to effect the good expected from it.

In speaking of the Military Board branch of the Public Works Department, we further noticed the great disadvantage under which that Board lies, in not having under its orders officers of the Engineer branch of the service to execute work in the provinces within our own frontier, and the damage thence accruing to the public service.

Plan of uniting all public works under one Board.

208. These circumstances led us to discuss carefully the scheme of annulling the present system of control, and creating in lieu of the three distinct superior authorities now existing, one Board to have control over public works of all kinds.* It appeared to us wasteful and unwise to have several controlling offices, each ignorant of the operations and the experience of the others, and two of them at least deficient in professional strength, and other two destitute of agents in the provinces; when by a union of all, the experience of all would be concentrated, the professional skill available would be most efficiently employed, and the local agents would be all under one head, and their services would be turned to the best account.

The total annual expenditure very large.

Our conviction of the necessity of such a change was strengthened when we turned

* The plan of a Board of Public Works is not a new proposal; it has been suggested at various times when the Government have been impressed with the necessity of modifying the present system; and it was lately urged by Major Pears in his Minute in the Military Board of the 24th December 1849, which was sent down for our consideration by the Government. It was also contemplated by the Honourable Court in their despatches, No. 4, of 31st March 1830, and No. 19, of 28th October 1835.

turned to the amount of the annual outlay. The statement in Appendix (Y.) brings together the whole expenditure on public works in all branches for 11 years, as far as we could collect it from the books of the Accountant-general. It will be there seen that the total sum spent in one year, under the control of the public works authorities, has already risen to above 24 lacs of rupees; and there is no doubt that this outlay will and ought to be considerably increased. The control of this large expenditure is now divided among a number of Boards and individual offices, with little attempt at system or order, so that the total outlay is never presented to Government at a single view, and some not inconsiderable items are liable to be left out of sight altogether.

The essentials of an efficient controlling authority.

209. We considered the following conditions essential to the efficient administration of this branch of the public service. That the works chosen for repair or construction should be carefully selected; that the aggregate expenditure allowed should be distributed in the best possible manner, with reference to the general interests, and not to local or accidental circumstances; that the control should be sufficiently close to ensure good execution, so far as that could be secured by the diligent use of the best means available; that results should be carefully ascertained and recorded for the information of Government; and that the controlling office should be able to ascertain and to inform Government who among its officers were doing their duty zealously and efficiently, and who in a merely perfunctory manner; so that the activity of all might be aroused by appropriate stimuli. It seemed clear to us, that considering the magnitude of the charge, these essentials of an efficient control could only be attained by means of a Board strong in the qualifications of its members, and having full time to devote to this duty; and the same considerations, viz., the magnitude of the interests concerned, both pecuniary and general, made it clear to us that it would be well worth while to attain the object by that means, especially as the cost would not be great.

Reasons for preferring a Board to an individual officer.

210. Various considerations led us, decidedly, to prefer a Board to an individual officer; in the first place, a Board is permanent, and the personal experience and knowledge of individual cases obtained in the course of business, is not lost to the department on every one of the changes of officers, so frequent in this country :—

2d. The work to be done would certainly be vastly too much for any single officer, even with an ordinary assistant; and either it must be incompletely done, as we are so anxious that it should not, or the officer at the head of the office must be provided with one or more assistants of standing and experience, who would in fact share his work, though not ostensibly his responsibility, and upon whom he might be tempted to throw too large a share of it.

3d. The Department of Public Works is one in which it is pre-eminently undesirable that all questions should be decided by the judgment of any one man, however able; and many questions would occur, in which Government would justly feel that it could not cordially and confidently accept the decision of an individual at the head of the department.

4th. The variety of the works coming under the Board's cognizance being so great, and the geographical extent of its jurisdiction so large, the varied experience of the members composing it, both as to place and as to species of occupation, would be in itself an advantage.

5. Although the two qualities of promptitude and direct responsibility are supposed to belong only to the agency of individual officers, still it is certain that the former may be secured in a Board also, by proper arrangements; and we believe that the latter may be obtained, in a high degree, in a Board composed of a small number of members carefully selected, by giving the free right of recording minutes of dissent, and of sending up such minutes to Government.

We have discussed the question with special reference to the circumstances of this Presidency.

211. Such are the considerations which lead us to recommend most strongly the creation of a single Board of Works. We have looked at the question in a practical point of view, and with particular reference to the circumstances of this Presidency, and it is in that spirit, we think, that it ought to be determined. The Honourable Court indeed (Despatch para. 63) dwell on the importance of assimilating the system of superintendence at all the Presidencies, but we beg respectfully to express dissent from that opinion. We would remark, in the first

 place,

place, that even if any one system could be pointed to as having been tried and proved to answer perfectly well under certain circumstances, yet other circumstances might make it unsuitable elsewhere. And we conceive, that the mere facts that a large part of the revenue of this Presidency depends on the works of irrigation, and that much more than one-half of the whole expenditure on public works is devoted to the maintenance and improvement of irrigation, are alone sufficient to make a system that may be suitable to Bengal or Bombay, not necessarily applicable here.

But even if this objection did not exist, no perfect or even eminently successful system can be appealed to in any part of India. On the contrary, all the objections urged against the working of the Madras system, such as inadequate and ill-considered estimates, long delay in settling bills, and great cost of superintendence, appear to be found in a still greater degree at the other Presidencies. There is no existing system then, that can be proposed as a model; and any new system must be an experiment. We propose that one, which after careful consideration we fully believe to be the best adapted to work well at this Presidency; but we do not recommend it as the best for the other Presidencies, nor, on the other hand, can we admit that the best plan there will of necessity be the best here.

Proposed composition of the Board of Public Works.

212. We will now state what appears to us the best constitution for the Board of Public Works.

Under this Presidency, the class of officers most conversant with the wants of the country, as respects both works of irrigation and roads, are the Collectors. The intimate connexion of the former class of works with the land revenue, renders them special objects of a Collector's attention; and as regards roads, the Collector from his constant intercourse with the people of his district, his periodical tours throughout it, and his familiarity with the natural features, the peculiar products, and the resources of every part of it, both inform him of the actual state of the roads, and give him the means of forming the best opinion as to the want of new lines or of improvements, and of ascertaining the results. It is the duty of the Collector, therefore, to propose projects of improvement for the investigation of the local Engineer, and he is likewise required to give his opinion on the expediency of such as may originate with the latter officer. Thus the two officers work together; the Engineer aiding and co-operating with the Collector; and it appears to us that the same species of combination should be secured in the Board of Public Works. The aid and counsel of an experienced Collector will be valuable there, and the more general views of such an officer will be of use in qualifying the otherwise too exclusively professional character of the Board; a further reason making it expedient to have in the Board a civilian of some standing, is that the Board will have much intercourse with the Collectors, and will be the referee in all cases of disagreement or difference of opinion between them and the engineers.

One member to be from the Civil Service.

213. We inclined at one time to the opinion that these requirements would be met by giving to some one member of the Revenue Board a seat also in the Board of Public Works; but on further consideration, we come to the conclusion that this arrangement would be a failure, that such an *ex officio* member would give nearly the whole of his time to his revenue duties, and would be unable to take any active part in the business of the Board of Public Works, as is actually the case now with the Public Works Department of the Board of Revenue. We felt that the department is of such a degree of importance, that the question of mere economy ought not to interfere with its being made quite efficient; and we resolved to recommend that the new Board should always contain a civil servant, holding that as his substantive appointment. One provision, however, seems necessary; it is undesirable that the changes in this appointment should be very frequent, and we beg to suggest that the holder of it should be eligible and entitled to rise in promotion with the members of the Revenue Board, without quitting his seat at the Board of Works. In other words, we propose that the civil member of the Board of Public Works should be regarded as on the same list with the members of the Board of Revenue, and that he might be either 2d, 3d or 4th in the list, according to circumstances. It may be expedient that the highest on the list should always be at the head of the Board of Revenue.

The Chief Engineer;

214. The Chief Engineer should be *ex officio* a member of the Board of Public Works, both in order to keep him in his proper position as head of the Engineer Corps,

Corps, and to give the Board the advantage of his experience. His services being no longer required in the Military Board, and as he will be relieved from all concern with the miscellaneous work of that Board, he will be able to give more time than at present to the Public Works Department. His counsel and opinion will often be very valuable; but considering that he will have his own duties as Chief Engineer to attend to, and bearing in mind the contingencies of an appointment, the succession to which is regulated wholly by seniority, it would be unsafe and inexpedient, in an office of such importance as the Board of Works, to reckon upon much real work in that Board from the Chief Engineer.

Two salaried professional members;

To complete the Board, we propose to constitute two salaried members, taken from the Engineer Corps; and as it will be essential to the right working of the Board that both these members shall be really efficient men, we consider it to be of the first importance that they should be selected, not on the principle of seniority, but with sole reference to their proved talents, activity, and special fitness for the office. We are aware, indeed, that no formal rule of this kind can entirely shut out the possibility of an occasional misuse of patronage in the appointment of an ill-qualified officer; but we cannot but hope that in so important an office private interests and regards will generally be postponed to a regard to the public good, and we think it far safer to trust to this reasonable expectation than to give any place to the other alternative, a nomination in virtue of seniority.

And a Secretary.

Lastly, the Board must have a Secretary, who should be an Officer of Engineers; but as we think it essential that all the real work of the Board shall be done by the members, more particularly by the Stipendiary Engineer Members, the Secretary will be strictly a ministerial officer, and his duties will be confined to conducting all routine business, and superintending the office establishment. We are of opinion, therefore, that he need not, and indeed ought not, to be an officer of very high standing. He should be one who has had some experience in the department in the Provinces, that he may be familiar with its work, and he should be in such a position as to salary, that his next step in promotion would be the post of Civil Engineer, and not a seat in the Board.

One of the members might travel.

215. A Board thus constructed would be found, we think, fully equal to the efficient discharge of the important duties entrusted to it; but we also think that those duties would fully occupy its time and attention. We may add, that part of our plan is, that of the three Engineer Members of the Board, one or other should be available, at the pleasure of Government, to travel occasionally into the interior, to report on any large project before the Board, to visit a large work in course of execution, or for any other suitable object.

Personal communication with Government.

Considering also how important it is that Government should fully understand the bearing and merits of projects laid before them by the Board, and how much more readily and effectually this knowledge may be conveyed by a little personal explanation than by correspondence, we think it very important that whenever any such project shall be before Government, one or more of the professional members of the Board of Works shall be called into the Council-room to furnish the explanation required. The adoption of this plan would do very much, we think, towards expediting the dispatch of business, and avoiding much tedious correspondence.

Proposed salaries of the members;

216. With regard to the salaries to be given to the new Board, that of the Civil Member must be such as to make the appointment an object of desire to a Collector; such as to enable Government to select the fittest from the Collectors. Associated with the condition or tacit understanding that progressive increase of salary should be given in the mode above explained, *Rs.* 2,800 a month would probably be sufficient to ensure a willing acceptance of the office. We would propose that as the salary of the new appointment, to be held indifferently by the civil member of the Board of Public Works, or by the junior member of the Board of Revenue, as the case may be. We propose that the salaried engineer members of the Board shall receive *Rs.* 1,100 each, in addition to the full regimental pay and allowances of their rank; and that the Secretary shall receive *Rs.* 500 a month, in addition to his full regimental pay and allowances. All staff salaries in the Engineer Corps are in addition to full regimental pay and allowances, and it seems to us inexpedient to introduce a new practice for these three appointments, even if the old one were not the best, as we think it is.

The Chief Engineer receives *Rs.* 1,250 a month staff salary, and the Superintending Engineer at the Presidency receives (with his salary as Civil Architect) *Rs.* 1,063.

Rs. 1,063. 10. 11.; all other staff salaries in the corps are inferior to these. It is obviously right that the post of Chief Engineer should be the most lucrative in the regiment; but no less certainly, the appointments in the Board of Works ought to be inferior to none but that. Again, when we compare the emoluments which we propose for them with those received now by stipendiary members of the Military Board and other officers at the Presidency, we find the former to be the smaller. A member of the Military Board receives *Rs.* 2,000 a month staff salary, in addition to his regimental pay only, and the comparison of the four appointments will be as follows: *

RANK.	Chief Engineer.	Superintending Engineer, Presidency Division.	Stipendiary Member of the Military Board.	Member of the proposed Board of Public Works.
	Rs. a. p.	*Rs. a. p.*	*Rs. a. p.*	*Rs. a. p.*
If a Captain - -	1,714 – –	1,497 4 11	2,121 12 –	1,533 10 –
If a Major - -	2,039 3 –	1,824 13 11	2,183 10 –	1,859 3 –
If a Lieutenant-Colonel	2,282 4 –	2,014 14 11	2,243 8 –	2,102 4 –
If a Colonel - -	2,545 5 –	- - -	- - -	2,396 5 –

It is obviously expedient that the emoluments of the appointments in the Board should be liberal, and we think that those which we propose cannot be considered by any means exorbitant.

And of the Secretary.

217. With regard to the Secretary, the staff pay of Civil Engineers is *Rs.* 700; that of a First Assistant Civil Engineer at present is only *Rs.* 200; but we shall propose below, for reasons to be stated, that it shall increase by gradations as far as *Rs.* 500. Our object being to give the power of selecting the best man from the First Assistant Civil Engineers (or District Engineers, as we propose to call them), for the office of Secretary to the Board, we would fix the salary of the appointment at this latter sum. It is true that this would not attract one of the highest grade; but if a man be of superior excellence, he will have been selected for the post before he has reached that grade; and, again, an officer of that grade, if put in, would hold the situation but a short time before he became eligible for that of Civil Engineer, and then he would be anxious to get away. On the other hand, *Rs.* 500 will be an object to all the First Assistants below the highest grade; and yet, considering the necessary expenses of the Presidency, it will be no exorbitant offer; and, being once settled at the Presidency, an officer will generally be disposed to stay till he can go up country as Civil Engineer. We will only add, that, in order to insure the services of men with some experience, we would limit the appointment to officers who have been not less than six years in the service, and who have had not less than three years actual work up the country as Assistant to a Civil Engineer.

Appointments to be abolished.

218. Our plan will relieve the Military Board of all concern with public works, and this will so much diminish its duties, that one of its stipendiary members may be dispensed with; and we should observe that our third member, Major Balfour (himself a stipendiary member of the Military Board), fully concurs in this opinion, provided the departments still remaining to the Board are brought into fully efficient

* We annex also a statement of the salaries of some other of the Chief Staff appointments at the Presidency.

RANK.	Quartermaster-General.	Commissary-General.	Deputy Commissary-General.	Mint Master.
	Rs. a. p.	*Rs. a. p.*	*Rs. a. p.*	*Rs. a. p.*
If a Captain - -	2,121 12 –	- - -	1,479 – 11	1,750 – –
If a Major - -	2,182 10 –	- - -	1,822 13 4	1,750 – –
If a Lieutenant-Colonel	2,243 8 –	2,432 13 9	2,065 14 11	1,750 – –
If a Colonel - -	- - -	2,493 13 9	—	—

efficient working order before the change takes place. The part of the office establishment now allowed for the Engineer branch in the Military Board may be spared to the Board of Public Works. We may add, that as the new arrangement will take two members from the Military Board (the Chief Engineer and one Stipendiary), leaving only two members (viz., the Commandant of Artillery and one Stipendiary), it may be expedient to strengthen it by again giving seats *ex officio* to the Adjutant-general and Quartermaster-general of the Army. The appointments of the Superintendent of Roads, and of the Secretary to the Board of Revenue in the Public Works Department, will likewise be discontinued, and the salaries of those appointments will cease.

We may add, that, considering the present salary of the Secretary to the Board of Revenue in the Department of Public Works (viz., *Rs.* 1,240) and that now proposed as sufficient for the Secretary to the new Board of Public Works (viz., *Rs.* 756), we think it open to inquiry whether the salary of the Secretary to the Military Board, which now amounts,* with regimental pay and allowances, to *Rs.* 1,540 as Captain, may not properly be diminished. It seems doubtful also whether the services of the Assistant Secretary, who receives *Rs.* 500 staff pay, might not be dispensed with.

The Board's duties should be those of control; and it should not be burdened with detail.

219. The new Board should have the whole control and direction of all public works, civil, military and miscellaneous, throughout the Presidency; viz., all irrigation works, roads, canals, railways, barracks, fortifications, revenue, judicial, military and general buildings, lighthouses, harbours, beacons, &c. With regard to the immediate functions of the Board, it appears to us that the duties of such a Board should be controlling only; and the more we look into the practical working of the existing system, the more the conviction is forced upon us that the present Board has too much forgotten its position of control. One of the chief duties of a controlling Board should be to take a general view of the whole country, and of its capabilities and requirements in every part, and to see that every province and every branch of improvement shall receive its due share of attention. This important duty appears to have been too much neglected. We have no periodical reports as to the state of the existing irrigation works; no record of their past and present condition of repair and productiveness; nothing to show whether they now yield more or less than formerly, and for what reason. Again, there are no comparisons of the scale of expenditure in one district with that of an adjoining one; no inquiry why so many projects of improvement came up from one division, and few or none from another; why one Civil Engineer inspects three-fourths of the work of his division, and another not one-fourth. And so also with roads: it must be admitted that the position of the Board of Revenue with respect to road improvements has been very discouraging, from the disfavour with which such proposals were received by Government; but still it might have been expected that the few which they did send up should have been the best possible. But the selection seems, in fact, to have been based on no general view; where a deserving project was sent up to the Board, it received their support; but no general inquiries appear to have been made as to the course of trade, or the most productive lines of road to repair or open. In short, the adoption of roads or districts for improvement has depended almost entirely on the accidental circumstances of the character of the local officers. Where the Collector and the Civil Engineer were active and able men, much improvement was effected; but where they were indifferent, nothing was done.†

220. We

* The Secretary to the Military Board receives *Rs.* 1,400 staff pay, in addition to his bare regimental pay, which latter varies a little, according to his rank and the branch of the service to which he belongs.

† In connexion with this subject, we beg to subjoin an extract from Lieut.-Colonel A. Cotton's reply to one of our queries: "I think, however, there is the most serious possible deficiency in the documents called for by the Board, inasmuch as the fundamental one, an annual complete report prepared by the head of the department from the divisional reports of the same kind, has never yet been prepared. While the business of the department is carried on by detached pieces, without a concentrated view being taken periodically of the whole, there cannot possibly be anything but confusion and anomalies throughout. How has it happened that one district, and even one talook, has been watched over and improved at a great expense, and another without any conceivable reason has been totally neglected; but from this unaccountable neglect of so obvious a measure, as that of calling for a document which should show the progress that had been made in every part of the Presidency, at one view. Nothing can be more obvious than this principle, a principle acknowledged in almost every other branch of the service, that at least once a year we should thoroughly examine our position;

Proper mode of exercising control.

220. We are most anxious to obviate this evil in the new Board. We propose to lay upon it large duties of control, such as have never been exercised by the existing Boards; but we think it essential that it should be relieved from duties of detail.

It should be the duty of the Board rather to control and direct operations, and to check and examine results, than to interfere with details which may be better left to the local officers. We conceive that the proper method for a controlling Board to exercise its functions is by general rules, leaving cases and details within those rules to the discretion of the subordinate authorities, whose proceedings should be brought annually under review by detailed reports. In the Public Works Department in particular, the essential character of the work makes it necessary that power should be entrusted to the local officers. And Government have in the Collectors and Civil Engineers a body of able and zealous servants, well qualified to judge of the wants of their districts and divisions, and to devise means for supplying them. A Collector is thought competent to exercise very large discretionary powers in connexion with the settlement and collection of the revenue, and is vested with the chief control of the magistracy and police among a million or a million and a half of people; his opinion is almost necessarily adopted as to improvements to be made, whether in irrigation works, roads, or buildings; and the expenditure of very large sums annually on public works is left to his management. But though thus largely trusted in these various ways, the Collector is inconsistently devoid of any power to authorize an improvement to the most trifling amount; and even as respects mere repairs, his powers are very much restricted, with the single exception of irrigation works, in which more latitude is necessarily allowed. This system appears to us to be very impolitic. After all, the Government are obliged to act on the opinion of the local officers; and the evil of the present system is, on the one hand, that work admitted to be necessary or beneficial is delayed; and on the other, that the zeal of officers is chilled by the display of want of confidence on the part of Government. In this and other similar instances, it appears to us that it would be better to give power and so derive advantage from talents and activity; and to take due notice of all cases of its misuse or abuse, and so maintain a guard against carelessness or misconduct.

Present absence of power in the local officers, Civil and Military, as to authorizing repairs.

221. Under the present rules no repairs to buildings in the Civil Department, even of the most trifling and ordinary character, except petty repairs under *Rs.* 20, can be ordered by the Collectors, without the previous sanction of the Government, obtained through the Board of Revenue. The delay thus occasioned increases, almost of necessity, the damage to be repaired; and it sometimes happens that when the authority for the work is received, the estimate has become insufficient, and a fresh one has to be prepared and sent up for sanction. It is the same with roads; except in the few cases where the Government has granted a yearly allowance for keeping in repair a certain pass or piece of road, no repair of the most trifling character can be executed without a formal and detailed estimate, which must pass through the various offices of the Civil Engineer, the Collector, the Board of Revenue, and the Government, and back again, before the work can be put in hand.

In

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position; see what progress we have made in the different districts; what results have been obtained; what has been overlooked; what remains to be done; what mistakes have been made; what encouragement there is to go forward, &c. &c. Is it possible that if such a review had been regularly made, some districts, many talooks, and thousands of works could have been almost or altogether neglected or lost sight of? Who, at this moment, can answer these questions; what amount of revenue is dependent upon irrigation works? What ought the existing works to produce if in good order; what, if certain obvious alterations or improvements were made in them; what proportion are now in tolerable order; what in a moderately effective state; what in a disgraceful state of neglect? What have been the results upon the whole, of the management and expenditure in the department? What proportion of new works or alterations have been profitable, and in what degree, and what proportion have been failures? What has been the loss of life, or revenue, or property, clearly attributable to neglect of obvious means? How often do we hear men talking of making a saving by spending less money on public works, without the knowledge of a single fact that would show whether the waste of public property is occasioned by spending too much or too little? How is it that every cook-room in a cantonment is examined, to ascertain whether sufficient money has been spent on it in the past year to prevent a needless waste in repairs in the following one, while any amount of loss may be incurred in the neglect of the most important and valuable works upon which the very lives of the population depend, without any document being required which should secure such a mistake being brought to notice."—Letter, 26 April 1851.

In the case of irrigation works, the importance to the revenue of their timely repair has led necessarily to the concession of a much larger amount of power to the Collector; and all repairs to those works, whether of an ordinary or emergent nature, may be authorized by the Collector. But even here the meaning of the term "ordinary repairs" has been narrowed of late years, so as to exclude some things formerly included in it. And we cannot but observe how inconsistent it seems that an officer who is empowered to expend 20,000, 50,000, and even a lack of rupees a year, at his own discretion, on works of this nature, is not permitted to disburse so much as even *Rs.* 100 on buildings or roads,* although those works from their very nature need repair not less certainly than tanks and channels, and although there would be precisely the same guarantee for the right exercise of the power.

In the Military Department, as we have already seen, there is considerably more license; Commanding Officers of Divisions are empowered to expend *Rs.* 50 every six months on each building, however small; and in case of any repair that can be said to be "emergently" required, they are authorized to lay out *Rs.* 500 on any one building. Here again is an inconsistency, to allow a measure of power to one class of officers, which is refused to another class, who in other ways are entrusted with much larger powers than the former.

All bills require the special sanction of Government.

222. Thus much of estimates: as regards bills, there is a still more jealous concentration of power. In the Civil Department every bill is required to be submitted for the special sanction of the Government. The expenditure has already been authorized on the estimate; but still, whether the actual cost exceeds the estimated, or whether it falls below it, the submission of a bill for the actual amount is alike imperative in every case, and the charge is not passed in the offices of account and audit till this has been done. The only exception, if such it can be called, is that in the case of the bills for petty repairs executed without previous sanction to travellers' bungalows, those of each district are submitted in a single view. But the amount of expenditure under this discretionary power is extremely small.

In the Military Department, again, there is rather more license than in the Civil. The Military Board is empowered to pass the bills for all the petty and emergent repairs spoken of in the foregoing paragraph, merely notifying the amount for the information of Government. Another instance, showing that these two branches of the Public Works Department have been too little considered together, and that there has been too little pains to apply to one of them, general rules adopted in the other and equally applicable to both. In that branch which is certainly the more orderly and systematic of the two, this small measure of independent power has been accorded to the controlling Board; while in the other branch, in which a much larger license of expenditure on certain classes of works is given to the local officers, this trifling power is withheld.

The Government has not the means of really dealing with the details of bills; and it is almost superfluous to say that the real check afforded by their submission in that form is nothing at all, as we shall explain more at large in speaking of the bills. But it bears the semblance of effective check; and with that prevailing jealousy which so much characterizes the system, the power is, for the sake of that semblance, taken from the controlling Boards, which have the means of exercising it efficiently, and added to the mass of detail which from all departments takes up so much of the time of the Government.

More latitude should be allowed on both points.

223. We are of opinion that the practice may beneficially be altered, as respects both estimates and bills. It appears to us to be a waste of time for the Government, or the Boards, to be engaged on operations which could be done as well or better by the subordinate authorities, viz., by the Boards or by the local authorities respectively. And it is more than waste, it is a positive evil, for either the Government or the Boards to be charged with duties which they cannot perform in reality; that their sanction and approval should be necessary in cases wherein the real decision must be made by a subordinate authority, and wherein not only the facts but

* To avoid the appearance of unfairness, we may here advert to the fact that every Collector has a small sum annually at his disposal for the repair of the roads. The amount is almost too absurdly small to be spoken of in serious terms: it is equal to one anna (three half pence) a year to each square mile of territory, or one rupee a year for every 2,750 inhabitants.

but even the opinions on which the resolution of the higher authority is based, must be obtained from such subordinate.

It is certain that all works need repair from time to time; but as to the exact time and species and amount, neither the Board nor the Government can possibly form an opinion; they necessarily take that of the local officer. So also with bills; Government has not at all the means of judging whether the sum charged is exactly right; the controlling Board has the means of doing this in a degree, but the Government not at all; it must necessarily adopt the Board's opinion, or differ from it on grounds of supposition only. One valuable guarantee for the right exercise of power is responsibility, when those who have the means of forming a judgment have the duty also of carrying that judgment into act; under the present system a superior power steps in, adopts the opinion without an intelligent knowledge of the grounds of it, and relieves the subordinate authority from the responsibility.

General principles recommended.

224. In treating of estimates and bills, we shall hereafter notice this matter in more detail; we will here only state the general principles which we think should be adopted. They are; 1st. That all repairs to buildings as well as to irrigation works should be undertaken by the local officers without the previous sanction of higher authority. 2d. That the same should be the case with regard to made roads; but that the plan of a permanent allowance for the repair of every such road, a plan which has been fully approved by the Honourable Court, should be generally adopted. 3d. That bills for repairs should be passed by the controlling Board without a reference to Government. 4th. That in the case of new works or improvements, when an estimate has been sanctioned by Government, the bill for the work should be finally passed by the Board, unless it exceed the estimate by a certain per centage to be fixed. 5th. That the operations of the Board under the preceding four rules shall be brought under the review of the Government in periodical reports. We are fully convinced that an annual report from the Board showing the expenditure in repairs to the various buildings, and the time when last repaired, and explaining any particular circumstances, would be far more useful to Government, would be a far more real and effective check on wasteful outlay, than the present plan of submitting all the bills in detail for sanction.

Already for the most part in operation in Bengal.

And we may observe that although these propositions may have an air of strangeness and novelty here, they are nearly coincident with the long established practice in Bengal. We give in Appendix (O.) a letter from the Military Board at Calcutta to the Board at Madras (dated 22d June 1852), certifying the practice there, as to the sanctioning of estimates and passing of bills, and we request attention to it.

Some power should be given to the local officers and to the Board of Works, in authorizing improvements also.

225. Nor indeed is this all that we shall propose; we think it will be expedient to go further, and to allow some discretion to collectors in undertaking not merely repairs, but also improvements in irrigation works and roads within certain limits. Several of the Collectors whose opinion is most worthy of consideration press the necessity of this measure, as essential to enable them vigorously to carry out improvements, and in order to prevent the delays which under the present system often postpone for years the execution of projects of acknowledged utility, and of insignificant cost. We fully concur in this opinion. Hitherto, indeed, though the ruling authorities have admitted in general terms the importance of promoting improvements, yet the view practically acted on has been that all expenditure is an evil, and that it is the duty of the controlling authorities to check it with but little reference to the valuable return to be obtained. But if this view is abandoned, and if it comes to be cordially recognized that such improvements are desirable, and that they are worth more than their money cost; if in short the Government really determines to enter on a course of increasing the resources of the State by investing capital in the roads and irrigation works, then it will be absolutely necessary that the power to authorize such expenditure should be in some degree localized, and should cease to be exclusively centred in the Government. In treating of the accounts of the department, we shall state the measure of discretion which we would propose at present; it will not be large, and if it is granted, it will probably be found expedient to extend it in a few years. With the same view of diminishing centralization, and of giving power in proportion to knowledge and the desert of confidence, we shall also propose that the Board of Public Works shall have the power to sanction new works and improvements, within certain limits arger than those prescribed to the Collectors.

226. We

226. We have stated our opinion that the control of Government over the ordinary proceedings of the Public Works Department should be exercised, as in other departments, rather by means of periodical reports, general and detailed, than by an investigation of individual cases; we will now describe the reports which for this purpose we think should come before Government:

Annual reports to be made to the Board of Works;

1st. Detailed annual reports shall be made to the Board of Public Works by the Collectors and Inspecting Engineers, both on the irrigation works and the roads in their districts and divisions. Those of the former will have more reference to the effect of works as exhibited in the revenue and the traffic, those of the latter will have more reference to the professional condition and aspect of the works. Both officers will report the general condition of the works of their districts, and both will detail the work of all kinds done in the course of the year under report, the Engineer Officer referring more to the execution, as to its rapidity, cheapness and efficiency, the Collector giving an exposition of his own proceedings under the discretionary powers of sanctioning work vested in him.

The Inspecting Engineer will also report on the work performed to public buildings:

2d. In the same manner the Inspecting Engineers beyond the frontier and at the Presidency, will submit detailed annual reports of the work done in their respective divisions.

3d. The Board of Public Works will carefully revise these reports, and will lay them before Government, with their own remarks. In these remarks they will specially notice the proceedings of the Collectors under their discretionary power of sanctioning improvements, and state their opinion how far those proceedings have been judicious or otherwise.

And by the Board to Government.

4th. The Board will also make a full report of their own proceedings under the powers vested in them, both as to authorizing works and sanctioning bills. They will submit statements of all the improvements or new works of all kinds which they have authorized, with the grounds on which they acted in so doing. And they will report on all the works for which they have passed bills in the course of the year; especially noticing not only how far the bills individually and collectively have agreed with or differed from the estimates, but also how far the rates charged for work have been fair and proper.

5th. They will also specially notice any cases in which rates may have been higher than ordinary, with the cause; and on the other hand any in which they have been reduced by good workmanship or good management. They will also notice any delay either in executing work or in submitting bills.

6th. They will submit detailed information as far as the nature of the case admits, respecting the result of irrigation works and roads improved or constructed in former years; procuring from the Collectors for this purpose all the information obtainable, and carrying on the record for as many years after the completion of the works, as the Government may be pleased to order.

Lastly. They will notice those districts or divisions in which the work of the department appears to be actively and effectually conducted by the several officers, and those where things are in a less satisfactory state, explaining the cause in both cases as far as they may be able.

227. Another important duty of the Board of Works should be to lay before Government annually an account current of the works under their control, especially of those of irrigation.

An annual account current of the cost and profit of irrigation works.

We trust that we have shown to the full satisfaction of all who shall read this report, that irrigation works are really valuable to the Government; and that the cost of constructing and maintaining such works is not capital thrown away, but so invested as to return a very handsome profit directly into the Treasury. But in order that this quality of that expenditure may be duly kept in mind, it is necessary that the outlay and the return should be periodically shown in comparison. For if the latter appears only as a part of the general land revenue, and is no where shown in its real character, while the former appears by itself, unconnected with its results, the expenditure will be regarded with jealousy and disfavour, and a disposition will prevail to restrain it within the narrowest possible limits. Whereas

if the annual accounts of disbursements is accompanied by a statement of the profits, it will be seen that the outlay is not a source of loss but of gain; and it will come to be regarded as one important means of developing the resources of the country and increasing the revenue, the light in which, we are persuaded, true economy requires that it should be viewed.

How it should be kept.

228. In order to carry out this idea, we propose that an account should be taken of the value of all existing works of irrigation, somewhat resembling the "Dead Stock Account," already kept of buildings; and that all the charges for such works, new or old, and the whole revenue derived from them, should be annually balanced and laid before Government. The value of the old works must be taken arbitrarily at some fixed number of years profit; that of works recently constructed, and of all formed hereafter, would be the actual cost. A certain per-centage of ordinary deterioration must be allowed annually as a deduction from their value, and on the other hand all additions and improvements, and even ordinary repairs, would appear as increasing it. While making this recommendation we are well aware that it will involve no little amount of labour to keep accurately and punctually such an account as we are speaking of, but the end in view seems an important one, and worth the cost and trouble. It would probably not be thought expedient, at least not at first, to keep such an account for every one of the many thousand existing works; but it might well be kept for each of the first-class works, and as regards the remainder a separate account for each talook.

The balance how to be struck.

229. In balancing the annual account of profit and loss, the interest of the capital and the cost of repairs and improvements, including that of superintendence, would appear as debits, while the receipts in the form of increased revenue would appear on the credit side. The amount of this profit would be obtained as respects the old works by deducting the Poonjah assessment of the land at the average rate of the village, from the actual Nunjah revenue received; while as respects modern works, the whole Nunjah assessment of land reclaimed from waste for Nunjah cultivation should be put to the credit of the work, and the difference between the Nunjah and Poonjah rates will be taken as the gain, only when the land had previously been usually cultivated with dry crops.

The above is only an outline of what we propose; if the general scope of it is approved, as we trust it will be, the details will remain to be settled by the Board of Works. In support of our suggestion we beg to cite the example of the canals in Upper India; a debtor and creditor account for which, not dissimilar in principle from that which we propose for the works of irrigation, is already made out every year and laid before Government by the Superintendent of Canals.

A similar account for roads.

230. The financial position of roads differs from that of irrigation works, inasmuch as they yield no direct money return; and even if any roads should hereafter be charged with a toll, they will rarely produce more, as indeed they ought not to be required to produce more, than is sufficient for their own maintenance. Yet even those that produce no direct money return whatever, are not worse in this particular than buildings; and as an account of the value of buildings is carefully kept, of those at least that are under the Military Board, we think that the same might be done in the case of roads and other communications. It would serve at the least to keep it in memory that such works have a value, and it would bring periodically under the notice of Government the financial position of those works which do produce something towards their own maintenance, and show which of them pay their own expenses. We may add, that in order to afford a clearer view of the actual utility of roads, even of those not yielding toll, a formula might perhaps be devised for deducing the value of the road from the number of conveyances using it, and the tonnage borne upon it, to be introduced as an element in the account current.

Procedure within the Board.

231. As regards the mode of proceeding within the Board, we will only specially suggest the following rules:—

1st. All letters, extracts from proceedings, orders and other documents, emanating from the Board, to any authority or office or party whatever, shall be under the signature of the Secretary for the time being.

2d. Questions before the Board shall be determined in cases of difference of opinion by the votes of the majority of the members present, and in case of

of an equal division of opinion the senior member to have a casting vote. Where a member may be absent on duty, his opinion shall be obtained on important questions before the Board.

3d. Members dissenting from the opinion of the majority shall have the privilege of recording minutes; and in case the resolution of the Board goes to Government, the minutes and counter-minutes shall go up also, if desired by the members recording them respectively. As to all other points we think no difficulty will be met with in drawing up a set of rules for the new Board, from those to which practice and experience have led the Board of Revenue and the Military Board. And we would recommend it as convenient that such rules should be drawn up and submitted for the approval of Government as soon as practicable after the Board shall have been constituted.

Course of business with other offices.

232. As regards the course of business between the Board of Works and other offices and departments, we beg to recommend the following general rules:

1st. In all cases and on all matters connected with the Public Works Department, the Board of Public Works will communicate with Collectors, and with Engineer and other officers, in the same terms as the Public Works Department of the Board of Revenue and the Engineer Department of the Military Board respectively do now; and it will exercise all the powers now held by those Boards respectively, except as they may be modified from time to time.

2d. Repairs to all descriptions of works being for the most part undertaken by the local authorities without the previous sanction of the Board, as above suggested, estimates exceeding the limit prescribed to the former, will be sent up direct to the Board by the proper engineer officer.

3d. In the case of new works and improvements we propose that the course should be as follows:

In the Military Department, as at present, the Commander-in-Chief will represent to Government the necessity for any work that he may wish to obtain sanction for, and the Government if they think proper, will direct the Board of Public Works to submit an estimate for it. Should the Commander-in-Chief desire to know the probable cost of a work before making application to Government, he will apply to the Board, through the Quartermaster-general of the army, for an approximate estimate; and the Board will be able to give such an estimate without much time or labour.

4th. A similar course will be followed with respect to revenue, judicial, ecclesiastical and marine buildings, and all the buildings at the Presidency; the same channels of communication being adhered to respectively as at present in the several departments.

5th. In the case of irrigation works and roads, the practice should be different. Here the project and estimate are so intimately connected that the former cannot be judged of till the latter is completed; and again, it is generally the same officer who conceives a project and prepares an estimate for it. In the case of these works then it will generally be more convenient that the proposal and the estimate should continue to come up together as at present, but it shall be open to an Engineer officer, if he shall think proper, to represent to the Board the general nature of a contemplated improvement and its probable cost, and leave it to the Board or the Government to decide whether the project shall be thoroughly investigated, and the estimate be accurately made.

6th. In all projects coming before the Board of Public Works for new irrigation works or the extension or improvement of old ones of a magnitude exceeding the powers of independent sanction vested in the Board, if that Board are satisfied generally of the judiciousness of the work, and approve the professional part of the plan, they shall transmit the papers to the Board of Revenue and obtain the opinion of that Board on the revenue bearing of the case, before coming to a resolution upon it. The Board of Revenue having considered the papers sent, and procured further information if necessary, from the Board of Public Works or from the Collector, shall communicate their opinion on the project.

The same course shall be followed in the case of projects of new roads or other communications, or extensions of old ones, exceeding the sanctioning power of the Board of Works:

7th. Although, in general, projects of improvements to irrigation works and roads will originate with the local officers, yet it shall be open to both the Board of Revenue and the Board of Public Works to take the initiative in calling the attention of Collectors or Civil Engineers to such improvements of either kind as their local knowledge or other means of information may lead them to think desirable, or to such deficiencies as may attract their notice. And either Board shall have the right to bring before Government for consideration projects of which the other Board may not approve.

8th. In cases where the Board of Public Works are empowered finally to pass bills, they shall communicate an extract from their proceedings to that effect to the Accountant-general; and such extract shall be sufficient authority to that officer to adjust the charge in the accounts.

The same with the Civil Auditor, in the case of tentage and other allowances which may be placed under the control of the Board.

Section VI.

The Value of Irrigation to the Revenue and to the general Wealth, and the Importance of maintaining and extending it.

Division of the subject.

233. We have next to consider the provincial branches of the Maramut Department, both the Civil Engineers and their subordinates, and the Executive Agents under the Collectors, and to state our opinion as to the proper numbers and the best organization of the several classes. And in order to do this clearly, it is necessary that we should take a view of the work to be done, as respects both irrigation and the means of communication.

We have already stated our opinion, that hitherto enough has not been done in either way to develope the resources of the country, or turn to account its great natural advantages; we will now state more at length the considerations which have led us to this conviction, as respects both irrigation and communication. The former of these two subjects will occupy the present section, and the latter the following one.

Present expenditure on the maintenance of irrigation works not sufficient.

234. First, then, as to irrigation. The outlay on this account may be divided into two branches; viz., the maintenance and improvement of existing works, and the formation of new works. With regard to the former, it appears certain that even existing works have not been kept in really efficient repair, except in a very few districts, and that the revenue of Government has fallen off in consequence; whereas by an opposite course of policy it would have been much augmented. The total revenue from irrigated land paying directly to Government, and not through Zemindars, Moottadars,* &c., is about 135 lacs of rupees; and, taking the revenue or Government share to be equal to two-fifths of the whole produce, and assuming one-tenth of the Ryotwar irrigated land to be enam or rent-free (a moderate computation), the value of the annual gross produce of the whole cannot be less than 375 lacs of rupees, or $3\frac{3}{4}$ millions sterling. The capital invested in the construction of these works may be assumed at 1,500 lacs of rupees, or 15 millions sterling, while the annual outlay for the repair and preservation of the works amounts, on the average of the last 10 years, to only about *Rs.* 7,00,000. The cost of repairs, therefore, is less than one-half per cent. on the assumed original cost of the works, under two per cent. on their gross yearly proceeds, and $4\frac{2}{3}$ per cent. on the annual revenue derived from them to Government. Now we believe it will be acknowledged by all persons acquainted with hydraulic works, that one-half per cent. on the original outlay must be too little to maintain in an efficient state works designed for the retention of water, and consisting in a great part of earthen embankments and loose stone revetments, constantly

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* In the case of Zemindars, Moottadars, &c., the irrigation works are under the care of such intermediate parties, a proportionate allowance being made on their Peishcush.

constantly exposed to the action of water, and that frequently running, or put in motion by the winds. In England, canals and other works in which water is retained require annual repair to the amount of from three to four per cent. on their original* cost, and though that includes the keeping up of towing-paths, &c., and the wear and tear of the banks from the passage of boats, yet, on the other hand, those canals are not exposed to the danger of a sudden and large influx of water like the tanks of this country, nor are their banks exposed to the action of waves raised by a gale of wind on a sheet of several square miles of water, as in the case of our more considerable tanks.

This is proved by the diminished extent of cultivation under the works.

235. *Primâ facie*, then, there is a presumption that the sum annually expended in the maintenance of existing works is too small, and this is confirmed by a reference to the actual results. To whatever part of the country we turn, we find the vast majority of tanks, even in a good season, watering far less land than they once did, and far less than they could now irrigate if kept in proper repair; and there is abundant evidence to show, that if the existing tanks were generally restored to their original capacity or efficiency, a very large increase of cultivation and revenue would be the result.

The total extent of Government land entered in the Revenue accounts of Fusly 1259 as capable of irrigation in the 12 chief irrigation† districts, is 26,82,260 acres, bearing an assessment of *Rs.* 1,84,21,555. The total extent of cultivation in the same year, which was almost everywhere a good season, was only 17,87,909 acres, with an assessment of *Rs.* 1,12,89,352, leaving waste no less than 18,94,359 acres, with an assessment of *Rs.* 71,32,203.

In most districts, it appears probable that the whole extent of the ayacut was formerly under cultivation, though not all at the same time. But there are some districts, as South Arcot and Chingleput, in which some land seems to have been entered in the accounts as irrigated, because lying conveniently for irrigation. There is also a considerable extent of land which appears to have been abandoned as of bad quality, perhaps exhausted for the time by over-cropping, without sufficient manuring; and some land in several districts, though entered as "irrigated" in the accounts, is stated to be now destitute of any apparent means of irrigation. Making allowance for these disabling causes by the deduction of even as much as one-third of the whole extent entered as irrigated, there will remain, in these 12 districts alone, 12,62,906 acres of land, with an assessment of *Rs.* 47,54,802, once irrigated and cultivated, and capable of being so cultivated again if the existing works only are well repaired.

The principal causes assigned by the Collectors as having led to this result, are, 1st. The works having fallen into disrepair; 2d. The want of water in tanks not out of repair; and, 3d. Too heavy assessment.

The works generally are out of repair.

236. We were desirous to give in this place a succinct view of the present state of the irrigation works of the country at large, and of every district, but we found it quite impossible to obtain the detailed information necessary. As to the roads, the annual reports made by the Collectors during the past six years, under the orders of Government, afford much information, of which we shall be able to make use in the following section. But as to the works of irrigation, no record of the kind exists, except in such an imperfect and incomplete state as to be useless for our purpose; and the only general view of the state of the works which we could obtain was in that Report on the Irrigation by Captain A. T. Cotton, to which we have already referred. He there writes as follows: "So generally, indeed, have I found the works in a defective state, that I believe I may say that nearly all the tanks in the country, and nearly all the channels, except those of Tanjore, and the very large ones of other districts, water less land than they once did; many only one-fourth, and very great numbers from one-half to three-fourths. And the actual revenue derived from several districts some years ago compared with the present, fully supports me in this opinion. By the statement above given, it appears that the Nunjah revenue of North Arcot is 3 lacs below what it was 10 years ago, out of 15 lacs; in South Arcot, 2 lacs out of 12; and in Tinnevelly,

* The proportion here stated is taken from Captain (now Lieutenant-Colonel) A. Cotton's Report on the Irrigation of the Country, dated 13 December 1837, of which we have made much use in this part of our Report, and which is printed entire in Appendix (B.)

† Bellary, Cuddapah, Nellore, North Arcot, South Arcot, Chingleput, Salem, Trichinopoly, Tanjore, Coimbatore, Madura and Tinnevelly.

velly, ¾ lac out of 11 ¾. But the falling off in the Nunjah revenue has, I believe, been going on for a long series of years. I cannot obtain accounts of the Nunjah revenue for more than a few years, because there are no returns of it distinct from the other items of revenue; however, that it has been falling off of late years is the principal point that it is necessary to ascertain at present, and that this is the case in several districts is shown by the above statement. The question indeed arises, Is this deficiency owing to the defective state of the public works, or to other causes? To this I can only reply, that from what I have seen I have no doubt it is owing to that cause, and I believe that it will be generally allowed to be so by the Revenue Officers and Engineers who have been employed in the irrigated districts.

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"21. As I have remarked above, it will probably be very difficult for many persons to bring themselves to believe the extent of loss that has been incurred by the grievous misapprehension of the importance of this question. I have been compelled to believe it myself by proofs which left no room for doubt. The loss by actual diminution of revenue in the two Southern Talooks of South Arcot in 30 years, has been certainly not less than 26 lacs of rupees; and no reason can be assigned why it ought not to have increased, under the circumstances of peace and orderly Government which they have enjoyed. The revenue is said once to have been four or five lacs, and I feel assured that it ought now to be near five lacs. If they had been managed properly for 30 years, I have no doubt that the revenue would by this time have been at least four and a half lacs; and in that case, the revenue of the 30 years would have been about 100 lacs instead of 56 lacs, a sum saved in the management of two Talooks, sufficient to have covered one-fourth of the cost of the whole tank expenses of the Carnatic for 30 years, at the rate of expenditure allowed of late. That this is not a preposterous calculation, seems to me to be indisputably shown by the improvement of the revenue since the year 1832, as shown in the statement."

The Northern Division.

237. During the 14 years that have elapsed since that Report was written, much has been done towards improving the works of irrigation in several districts. In the absence of any existing record of the condition of the works we applied to the several Civil Engineers, requesting their opinions as to their present state, both absolutely, and relatively to what it was 15 or 20 years ago. We may observe here, that this means of gaining information on such a subject, is necessarily inferior in fulness and detail, to that of a series of periodical reports. As to the past, few officers would have sufficiently accurate recollection to speak in any but very general terms; and even as to the present information thus obtained on an emergency must needs be deficient. Any single officer's acquaintance with the thousands of works in his division, must be very partial; and, perhaps, there might be in some cases an unconscious backwardness to state the worst. We shall have to show, that if the works are in bad order, the Civil Engineers cannot be blamed: but yet an officer might be unwilling to admit, even to himself, that works of which he had been charged with the oversight for several years were still imperfect; or he might be averse to seem to throw blame on his predecessors. In replying to our question, almost all the Civil Engineers report that much improvement has taken place in the course of the time there specified, which we are glad to say is undoubtedly true; but most of them have overlooked the former part of the question. Most of those who answer it, describe the works generally as being still inefficient. Colonel A. T. Cotton referring to the works in his present (the 1st) Division, speaks in much the same terms that he formerly used in speaking of the country at large. He says, "In this division, there is scarcely a single work that is in a respectable state; and almost the whole of them are without proper sluices, calingalahs, &c., so as to secure their supply or efficiency."

In another letter he writes as follows: "From all that I have learnt respecting the works in this division, they are in all respects, both as to original construction and present condition, in a most imperfect state. With respect to their former state, it is to be observed, that 20 years ago, by far the greater part of these districts was in the hands of Zemindars, and a great number of the estates have only come under Government management very lately; much is still under Zemindars. The state of the works under the Zemindars seems to have been very various, but I judge that almost all of them took much better care of them than our Government has done. In one, the Pittapoor estate, I have satisfied

satisfied myself that the works were in excellent repair under the grandfather of the present Zemindar; but at his death the estate came under Government management in consequence of a minority, and when the estate was given up to his son 15 years afterwards, the whole of the works were in a complete state of neglect and ruin. I inspected several of them at the request of the Zemindar. During the last 10 years, some little has been done to put the Government works in order; but since I came into the Division, my time and attention has been so taken up with the anicut project, that I have not been able to do anything about the whole works out of the Delta, further than to urge a liberal outlay upon them by the Collector's Department. I have reason to believe that most of the tanks are in want of complete revision; they have no proper calingalahs, sluices, supplying channels, &c., and the drainage of the country is in many places as bad as the supply. Below the Colair, numbers of villages are submerged till the rains are over, and begin to cultivate when they have hardly any hope of rain enough to secure a crop. Late last year, at the very end of the rains, I passed in my boat over a great extent of water, many miles together, and if I had not been assured that there was a Talook underneath, I should have supposed I was in the Colair Lake. In one place I saw the people punting in a piece of water, which, I was informed, they were going to bale out, that they might begin to cultivate; this was the only sign of land and cultivation that I saw in 15 or 20 villages that I passed over. The drainage of this tract will, of course, come under our present operations; but it shows the state of neglect which was permitted in these districts; no wonder that under such management, this rich country yielded only one-third of what Tanjore did in revenue, though naturally the latter is much inferior to it." Appendix (C.), para. 8.

The works of the subdivision.

238. Lieut. F. H. Rundall, who has charge of the subdivision, comprising the two districts of Ganjam and Vizagapatam, thus speaks of the irrigation works in those districts: "The whole of the irrigation works in the subdivision, with the exception of the two Amauny Talooks of Vizagapatam, have been almost entirely neglected, and stand in great need of repair." In another letter he speaks more fully, as follows: "The condition of the works of irrigation in the two Amauny Talooks of Vizagapatam is decidedly improved, from the late expenditure laid out upon them. Those in the Vizianagarum Zemindary again, have mostly gone to ruin. While those in the Ganjam district, have been almost entirely neglected; and the Commissioners will observe the case could not have been otherwise, with an annual expenditure of no more than about *Rs.* 2,500, on works yielding a land revenue of five lacs of rupees, being about ½ per cent. of the revenue actually derived by Government. All the tanks and channels that I have inspected in the Ganjam district, are in need of thorough repair; there is scarcely a sluice or calingulah to any one of them, and in the event of heavy rains, they must breach, as almost all of them have done. The river channels are unprotected with head sluices; a calingulah here and there has been constructed; this, however, does not obviate the evil of the bed scouring out, and the head enlarging. The consequence has been that increased quantities of water have been forced down, unusually high freshes have aggravated the evil; and, in one or two instances, the channels have been so enlarged, that they threatened to alter the course of the river itself. They are almost all carried with a very great fall in their bed, and consequently give occasion to a current injurious alike to their bed and sides; an evil twofold increased when there are no regulating works at their head. And as these evils have all been allowed not only to continue, but consequently to increase, the inference naturally is, that the irrigation works must be in a much worse state now than they were 20 years ago."

The other Divisions.

239. The Northern Division has certainly been more neglected than any other; but Captain Lawford also, in a Division (the 6th) in which the works have always been better attended to than any where else, writes as follows: "The tanks and channels generally are not by any means in a state of good order; many sluices are out of repair, more are required; the same as to calingulahs. Land is certainly left uncultivated for want of such works, or from their being inefficient." Captain Smyth, in the 5th Division, speaks to the same effect; he says, "The greater portion of the tanks and watercourses are at present in tolerable order, while much improvement is required in their stability, particularly in the works in the South Arcot District. The practice generally obtains of cutting openings in the bunds of tanks and channels for irrigation purposes, and this requires to be checked by

by the construction of permanent sluices. A large number of tanks require their sluices to be renewed, &c., and in almost every Talook the revenue accounts exhibit a loss for want of proper means of irrigation." In the 8th Division only, Captain Horsley speaks of the works as being generally in tolerable order; and undoubtedly his own unceasing exertions have been directed to that end for a number of years. But we believe, that if he had more time to attend to improvements, his idea of what good order means, would much enlarge; certainly there is a large extent of land in the 8th Division, now uncultivated for many years, though once irrigated and productive. Again, the Civil Engineer of the 4th Division, speaks of the tanks generally as being "in very fair order;" but he mentions, that in one extensive portion of his charge, many sluices are reported out of repair; and as to the channels, he describes them generally as being neglected. He also mentions having taken measures to clear out the supply-channel of the very large tank of Chembrumbaukum, which had been allowed to become filled up and useless, and to remain so for some years, before it came to his notice; and in this single case, an annual loss of probably not less than *Rs.* 10,000, for a number of years, was entailed on the Government in revenue, besides a much greater loss to the Ryot.

General view.

240. The experience and observation of the first and second members of our Commission fully bear out the foregoing accounts of the deficiencies of the existing works of irrigation; more particularly as to the disrepair of sluices and the want of calingulahs in a vast number of tanks, and the neglect of their sources of supply. Formerly when all tank estimates were made by the Tahsildars, the repair consisted generally of earth and loose stone work, and sluices and calingulahs were rarely meddled with; and even of late years the restrictions on the execution of masonry work have operated to limit the repair and construction of these necessary works. Consequently many of the old sluices, which were generally much less substantially built than the more recent ones,* having either become leaky, or been choked up by the falling in of the roof, have so remained. This has entailed in the former case constant waste of water; and in the latter inability to use the sluice at all, so that either the land usually watered by it is left uncultivated, or the very dangerous remedy adverted to by Captain Smyth, has been adopted, of annually cutting a passage for the water through the bund, from the top to the bottom. This expedient is resorted to by the Ryots, to avoid the loss of having their lands waste; but it has frequently caused the breaching of the tank, to the great loss of both Government and Ryot, through an unexpected influx of water into the tank while the gap was open.

In short, all the works in the country, with a few exceptions, are in a state that may be called "below par;" that is, they are below their state of full efficiency, and incapable of effecting their proper amount of irrigation. The tanks are in want of sluices, or such as they have are out of order; or they have no calingulahs, or such as they have are too small or too high, and so the stability of the tank is in danger; or the bank is low or weak, and the Ryots are afraid to store a full tank; or their channels of supply have become choked up, and no longer bring a full supply of water. And as to the irrigating channels, many of them are in the condition described by Lieutenant Rundall, from the want of regulating works at their head; or they have become filled up by deposit, or the river has thrown up a bank in front of them and they get no water; or they have too few outlets for irrigation and the Ryots cut through the bank; or the outlets are too large, and a vast quantity of water is wasted. Such is unfortunately the description which now applies to a very large proportion of all the works of irrigation throughout the country, with the partial exception of the favoured districts of Tanjore, and a part of Trichinopoly.

Results of increased expenditure in Tinnevelly.

241. As practical proof that the works of the country generally have not been maintained in good condition, and to show the advantage of liberal expenditure (under efficient direction) on this object, we will state the results obtained in some districts where of late years more attention has been paid to the works of irrigation. We will first take the case of Tinnevelly. This district has had for the last eleven years a most active Civil Engineer in Captain Horsley. The expenditure on Maramut

* This remark does not apply to the old sluices of the largest tanks, which were often most expensively and substantially constructed of cut stone.

mut works has largely increased, the works receiving repair or improvement have been carefully selected by Captain Horsley, and the work done thoroughly inspected; he has also taken some pains to improve the Maistries. A considerable part of the outlay has been included technically under the term "Occasional," but few or no large works have been undertaken, or attempts made to extend irrigation to tracts not already possessing it; almost the whole of the expenditure having been incurred in maintaining or increasing the efficiency of existing works.

Maramut expenditure in the district.

242. Appendix (Q.) is a statement showing at once the irrigated revenue of the district for the 29 years from Fusly 1232 to Fusly 1260 inclusive (there being no detailed accounts of Fusly 1231) and the Maramut expenditure for the 30 years 1821 to 1850 inclusive.

The average yearly Maramut expenditure in each five years of the series is given in the margin. In the first of these periods the amount was very small, being no more than 2¼ per cent. on the irrigated revenue during the same time; the subsequent expenditure has been on a much larger scale, but previously to 1838, that professional assistance and oversight which we have spoken of as so essential both to guide the selection of work to be done, and to control and supervise the execution, were, in effect, wholly wanting. Prior to 1834 there was only a single Engineer Officer to five districts, of which Tinnevelly was one; the area of the whole being 38,460 square miles, (larger by one-fifth than the whole of Ireland) and the length from North to South, 500 miles. From 1834 to 1838 the division of the Civil Engineer comprised four collectorates, Tinnevelly, Madura, Coimbatore, and Salem, with a total area of 32,880 square miles, being just equal to that of Ireland.

Years.	Average Annual Maramut outlay.
1821 to 1825 -	25,197
1826 to 1830 -	41,388
1831 to 1835 -	43,884
1836 to 1840 -	56,279
1841 to 1845 -	41,033
1846 to 1850 -	64,253

It was utterly impossible that under such circumstances the Civil Engineer could exercise any close or effective control in any part of so vast a charge; and practically the Maramut work was left almost entirely to the Tahsildars and Maistries, of whose unfitness for the unaided discharge of this duty we have already spoken. In 1838 occurred those alterations in the department which we have described in the commencement of this Report, para. 9, and by which the territorial extent of each officer's charge was so much diminished; and it is from that period chiefly, and only in a minor degree before that, that the effects of the larger outlay on Maramut works are to be looked for.

The revenue from irrigation.

243. The marginal statement shows the average annual revenue from irrigated land in each five years of the period above specified. The average of the first period (four years*) was high, in consequence of two or three very favourable seasons which followed the resumption of Ryotwar settlements in Fusly 1232; in the next period there is a large falling off; but in each succeeding five years there is a considerable increase, and the average of the last period is nearly a lac and a half of rupees above that of the first in the series. That of the last but one, (Fusly 1251 to 1255) would show much better, but for two very bad years, Fusly 1251 and 1252 included in that term. We think we shall obtain a just view of the results of the increased outlay on Maramut improvements, by comparing the expenditure and the revenue from irrigated land in the first two periods of the series, with what they were in the last three periods. The aggregate income of the first nine years was *Rs.* 94,55,647, or *Rs.* 10,50,633 annually; and the aggregate Maramut expenditure of the first 10 years was *Rs.* 3,22,938, or *Rs.* 32,293 annually. In the last 15 years the aggregate income was *Rs.* 1,77,33,875 or *Rs.* 11,82,258 annually; and the Maramut outlay was *Rs.* 8,07,826 or *Rs.* 53,855 annually. The total excess of the expenditure in these 15 years over what it would have been on the average of the first 10 years, was *Rs.* 3,23,419; but the aggregate excess of revenue from irrigated land during the last 15 years, over what it would have been at the average of the first nine, is *Rs.* 19,74,830.

Fuslies.	Average Annual Irrigated Revenue.
1232 to 1235 -	11,54,218
1236 to 1240 -	9,67,765
1242 to 1245 -	10,03,083†
1246 to 1250 -	11,21,921
1251 to 1255 -	11,32,455
1256 to 1260 -	12,92,399

Highly favourable result.

We think we are fully justified in ascribing this large and progressive increase in the revenue to the improvement of the works of irrigation; since it is spread over far too long a term to be attributable to a series of good seasons, and we have already

* There are no accounts for Fusly 1231, as the district was under the decennial village rent.

† Fusly 1241, is omitted in taking the average; as there was so entire a failure of the monsoon in that year, as to reduce the irrigated revenue in this and other districts to little more than half its usual amount

already remarked that the last 15 years contain two decidedly bad seasons. We have then an increase of outlay to the amount of *Rs.* 3,23,419, producing a direct return in revenue of *Rs.* 19,74,830, or about six for one; besides an addition of 30 lacs to the income of the people.

One important and cheap species of improvement.

244. We have already observed that by far the greater part of the gain in Tinnevelly was obtained by the efficient repair of existing works; and a very large part of it by rendering supplies of water comparatively certain, which before were precarious. This is a most important species of improvement. There are many works which in a good year will water perhaps 300 acres, and suffice to bring the whole to maturity; but in ordinary years will irrigate only two-thirds of that extent, and even then leave a part of the crop to fail for want of water. In such cases, if the Ryots keep up stock and labour to cultivate the whole extent, they are put to a useless expense in years when the supply of water is deficient; and if they do not, they are unable to take advantage of a good year. Add to this that Ryots always lose more than the Government from the failure of crops, for if it is a partial failure they get no remission of rent, and even for a total failure the whole rent is rarely remitted. Now in many such cases a small sum judiciously laid out will so improve the supply as to reduce the fluctuation to a minimum, and both secure the Government revenue, and ensure to the Ryot the profitable employment of his capital and labour. It must be obvious, however, that such improvements eminently require the skill and judgment of a regular Engineer.

Results of expenditure in South Arcot.

245. The second instance which we will give of former neglect and consequent loss of revenue and immediate improvement on the works being repaired, is that of Manargoody and Chillumbrum, the two southern talooks of the South Arcot district. Those talooks form a part of the base of the alluvial Delta of the Cauvery, lying immediately contiguous to the north bank of the Coleroon. They are thus most advantageously situated for irrigation from that river, and have for ages been so watered. The chief source of supply is the Vuddavar channel, which besides supplying direct irrigation to a considerable extent, fills the large tank called the Veeranum; there are also other ancient channels, as the Khan Saib and the Coomaratchy, which water extensive tracts. The irrigation of these talooks had been very much neglected,* so that the channels had become filled up and the Nunjah revenue had declined from an average of about two lacs at the early part of our possession, to *Rs.* 1,24,000, the average of the 10 years prior to Fusly 1244. In 1834 and the following years the Vuddavar channel was entirely repaired, and in 1836 the lower anicut was built across the Coleroon, immediately at its head. The two other channels already mentioned were brought up to the same point, and in 1839 other channels were dug to complete the irrigation of the whole tract. The Sheally talook of the Tanjore district is on the south side of the Coleroon at that point, and a part of it had been precariously watered from the river. After the anicut was built, channels were planned from it to improve and extend this irrigation, and were excavated in the course of the five years, 1837 to 1841. Appendix (R.) gives the cost and the results of all these improvements; the following are the main particulars.

The lower Coleroon anicut.

Consequent increase of Revenue.

246. In South Arcot the revenue rose immediately, even before the works were fully completed. In Fusly 1243 it was only *Rs.* 1,19,055; it gradually rose till in Fusly 1249 it amounted to *Rs.* 2,66,332, it then declined for three years, after which it again began to rise, and in Fusly 1256 was *Rs.* 3,03,758; it then declined again for three years, and in Fusly 1259 was only *Rs.* 1,83,488, but in Fusly 1260, the year just expired, it again rose to *Rs.* 2,62,631. We shall notice these fluctuations presently; we will here only point out how great, notwithstanding, has been the profit to Government from these works. The average annual collection for the 11† years preceding the improvements, (viz. Fusly 1233 to Fusly 1243) was *Rs.* 1,22,065, while the average for the 14 years following the construction of the anicut, (viz. Fuslies 1247 to 1260) is *Rs.* 2,37,146, being an annual gain of more than *Rs.* 1,15,000. The aggregate increase in the whole 14 years amounts to *Rs.* 16,11,134. The total cost of building the anicut, of

* *See* also Appendix (B.) paras. 10 and 16.

† We omit from both periods the three years Fuslies 1244 to 1246, because the improvements were then in progress.

of the repair of the ancient channels, the excavation of the new channels, and of all subsequent improvements and repairs, has amounted to *Rs.* 3,59,015.

On the Tanjore side the average annual collections in the six years Fuslies 1241 to 1246, being all those of which we have received accounts, amounted to *Rs.* 1,26,215; while the average of the 14 years following the construction of the anicut, is *Rs.*1,39,868. The average annual increase of collections has been *Rs.*13,653, and the cultivation and revenue appear to be steadily advancing; the whole aggregate increase is *Rs.*1,91,142. The total cost of the works on this side of the river, including all subsequent improvements and repairs, has amounted to *Rs.* 97,663.

Net results.

247. Adding together the results on both sides of the river, the following are the facts. The total cost of the anicut and all the connected works, inclusive of all repairs to the end of 1850, is *Rs.* 4,56,678. The total aggregate excess of collections subsequently, over what they would have been in the same period, at the average obtained before the improvements, is *Rs.*18,00,298. Thus within the short period of 14 years there has been a return of *Rs.* 375 for every *Rs.* 100 expended; while the anicut and channels remain permanently valuable works. And taking their total original cost at *Rs.* 3,50,000, and assuming that annual repair to the amount of even as much as two per cent. on that will be required to keep them in good order, we have the cost of these annual repairs *Rs.* 7,000, and 17,500, being interest at the rate of 5 per cent. on the original outlay, total *Rs.* 24,500, to set off against an annual gain of *Rs.*1,28,756, being a net annual gain of above one lac of rupees, clear of all expenses, obtained by an outlay of three and a half lacs. And to this large gain to the Government must be added the share of the Ryot, to the amount yearly of *Rs.*1,93,000 more; being an aggregate yearly net return of nearly three lacs of rupees, for an outlay of three and a half lacs.

But the revenue has fluctuated more than the supply of water.

248. But though the increase of revenue in South Arcot resulting from the construction of the lower anicut has been so large, and has already paid the cost of the work several times over, yet the receipts have exhibited much fluctuation from year to year, and much more than the supply of water, which has been remarkably steady and uniform. The statement given in the margin shows the Nunjah revenue of these talooks in each year since the anicut was built, and it will be seen that there is a difference of *Rs.*1,32,171 between the highest and the lowest, though the supply of water has fluctuated very little. These facts are of importance, from their bearing on the question how far improved means of irrigation will be taken advantage of by the Ryots when provided; and we therefore thought it our duty to endeavour to ascertain the cause, and we obtained from the Collector a full report in explanation of it; we have also received some useful information and suggestions from the Civil Engineer.

Fuslies.	Revenue in Rupees.
1247	2,30,319
1248	2,52,975
1249	2,66,333
1250	2,58,131
1251	2,02,815
1252	1,71,587
1253	2,01,427
1254	2,21,958
1255	2,45,200
1256	3,03,758
1257	2,93,105
1258	2,25,642
1259	1,83,488
1260	2,62,631

The chief or only cause of the decrease of cultivation whenever it has occurred, seems to be the low price of grain in those years, coupled with a high assessment and an extreme want of good roads. The statement, Appendix (R.), exhibits a singular exactness of proportion between the variations in the extent of cultivation and the range of price for the year, the former varying inversely as the latter with extreme regularity.

High assessment.

249. As to the assessment, the average in these talooks is 50 per cent. higher than in the contiguous district of Tanjore, in spite of the greater advantages of the latter province in almost every particular. The expediency of reducing it not only in these talooks, but throughout the district of South Arcot, has been before the Board of Revenue and Government on several distinct occasions during the last 25 years, but no final decision on the subject appears to have been yet arrived at.

Extreme want of roads.

And not only is the Government tax so much higher than in Tanjore, but the communications are in an infinitely worse condition. The Tanjore district is everywhere traversed by excellent roads made during the last 20 years, and in great part out of the surplus pagoda funds; in South Arcot those funds, if any, were insignificant, and Government money has not been given. The talooks of Chillumbrum and Manargoody are alluvial, and being almost wholly under wet cultivation, and traversed by numerous irrigation channels, the communications are necessarily difficult unless carefully maintained; in point of fact they appear to have been almost entirely neglected. In 1841, indeed, a proposal was made to

construct a road from the town of Manargoody to Chillumbrum, and another from the latter place to Bowangherry, the chief town of an adjoining talook. The total length of the two roads was 18 miles, and the estimated cost *Rs.* 27,276, including a number of bridges. It was stated by the Board in sending up the project to Government that there were no regular roads between the three places; that the country was swampy, and intercommunication consequently most difficult; and for a considerable part of the year impossible; and that this state of things was very inconvenient, as the roads were much used during the dry weather in spite of their bad condition. They added, that the large irrigation channels which intersect this part of the country at short intervals greatly impeded traffic, and ought to be bridged; that the anicut, which had largely augmented the revenue, had added extremely by the increased irrigation to the difficulty of travelling; and that a good road connecting the three chief towns was therefore very much required. The project was sent up to Bengal with the strong recommendation of this Government in its favour; but sanction was refused, and the chief roads in the talooks still remain nearly in the disgraceful state above described.

The navigable channels have been neglected.

250. The main irrigation channel from the anicut was intended to be navigable, and to afford a communication with Porto Novo; but it appears to be little used, as in consequence of the waste of water through mismanagement of the numerous sluices of irrigation, and the neglect to keep the canal itself free from obstructions and accumulations, boats can rarely pass without much difficulty, and frequently cannot pass at all. The letter in Appendix (N.) from the agent of the Porto Novo Iron Company, details the difficulties and delays experienced in this navigation, and will be read with interest as coming from one practically and painfully acquainted with what he describes.

Porto Novo is very conveniently situated for the shipment of the grain of these talooks; and it might be expected that they would take a share in the export of grain to Ceylon, which goes on so briskly from Tanjore. But the higher assessment which they pay, and the want of good means of communication between the villages and the port, tend to disable them from this competition, and the quantity so exported is very trifling. An additional cause assigned by the Civil Engineer, Captain Lawford, is the "deteriorated state" of the port of Porto Novo. "Petitions," he says, "have been presented to me on the subject by the merchants, and a plan of partial improvement is before the Board:" and he goes on to say, that such partial measures cannot produce much effect, and that it would be useless to ask the Government to do the work completely.

Remedies for these evils.

251. Independently of the question of the assessment, which, however, we cannot but regard as very important, a good deal might be done in other ways to neutralize the disadvantages which now bear down these talooks:

1st. The roads should be improved, both the main lines and the cross roads connecting the out-villages with the chief towns, and with the coast.

2d. The canal must be placed under better supervision; the sluices must be better attended to, so as to prevent the waste of water which now takes place through the carelessness or malevolence of the villages nearest the head of the channel; and the canal itself must be kept free from obstructions. For these two objects, both so important, it is absolutely necessary that the canal should be provided with adequate professional supervision; no measures unaccompanied by this can effect any permanent improvement in its usefulness. But this need not be a charge to Government; if duly kept in repair, a very light toll on the boats using it will abundantly pay all expenses fairly chargeable to the navigation, including the cost of superintendence.

3d. The port of Porto Novo is stated to be in want of some improvements which should be attended to.

We may observe, lastly, to show what is required in these talooks, that in the contiguous parts of Tanjore, which are very similar to these, except in those points on which we have pointed out a difference, there is no fluctuation of the revenue. The Ryots grumble indeed at the low prices, but they cultivate their lands fully, and the revenue is kept up to its full standard; indeed both cultivation and revenue seem there to be steadily increasing year by year.

Results of expenditure in Tanjore.

252. The next case of this kind which we will notice is that of Tanjore. This province has always been better cared for in the way of irrigation than any other, both

both as regards the amount of outlay and the talents of the Engineer Officers carefully selected for this important charge. Here then, if anywhere, under our administration, the effects of irrigation would long ago have reached their maximum, and it might have been supposed that no room would be found for further improvement. But such has not been the case; and an examination of the accounts of the Maramut expenditure and of the revenue for the last 30 years, shows that even in this favoured district, an increase of judicious and skilful outlay on the irrigation works in the latter part of that period has produced large returns.

In the 10 years from 1821 to 1830 inclusive (*see* Appendix S.), the Maramut expenditure in Tanjore averaged *Rs.* 49,200. Immediately after the latter year the expenditure increased, and within a few years the upper anicut and the works connected with it were constructed; the annual outlay has continued permanently higher than in the former period; and the yearly average of the 20 years, 1831 to 1850, is *Rs.* 91,523, or little less than double that of the preceding 10 years. The aggregate excess of the outlay in this 20 years, above what it would have been on the average of the preceding 10, is *Rs.* 8,99,370.

Increase of revenue.

253. During the 10 fuslies, 1231 to 1240, the revenue from irrigated land averaged *Rs.* 29,44,685; in the following 20 years it averaged *Rs.* 30,83,448. (*see* Appendix S.) Its aggregate excess in the latter period over what it would have been at the average of the former period, was *Rs.* 27,75,250, being a return directly into the Treasury of more than three for one on the aggregate additional Maramut expenditure. Nor indeed does this by any means justly represent the case; for it must not be forgotten, that about the period when this increased expenditure began, the revenue of Tanjore was decidedly declining from failure of water, and serious apprehensions were entertained that the sources of irrigation would fail altogether; and there is strong reason for believing that such a consummation would speedily have followed, but for the works then undertaken.

Gain to the people.

254. In this collectorate also, the Ryot and the general consumer have gained by the improvements even more than usual in proportion to the gain in revenue. In the first place, the assessment in Tanjore is very much lighter than in any other district. Again, in part of Tanjore the demand on a given field varies from year to year with the selling price of grain, and this fluctuation was still larger under the Amauny system, which formerly prevailed; and the price of grain having materially fallen during the last 20 years, a given amount of revenue indicates a larger extent of cultivation and produce now than formerly. Thus the average extent of land annually cultivated during the 10 fuslies, 1231 to 1240, was 5,57,556 acres; during the following 20 years it was 6,36,425 acres; being a much larger proportionate increase than appears in the revenue; for whereas the average yearly revenue of the second period was $4\frac{1}{2}$ per cent. above that of the first, the average extent of cultivation in the later was 11 per cent. greater than in the earlier. And it is shown by returns which we have obtained from the Collector, that the average produce per acre cultivated, is not only larger than formerly, but less variable.*

It

* The following small Statement shows the average extent of cultivation and revenue in Tanjore for each five of the last 30 years; it will be observed that the average extent cultivated exhibits an increase in each successive five years.

PERIOD.	Cultivation in Acres.	Revenue in Rupees.
Fusly 1231 to 1235 - -	5,38,899	32,56,795
„ 1236 to 1240 - -	5,76,214	26,32,575
„ 1241 to 1245 - -	6,04,447	29,93,315
„ 1246 to 1250 - -	6,20,178	30,30,631
„ 1251 to 1255 - -	6,49,682	30,78,878
„ 1256 to 1260 - -	6,71,394	32,30,967

The high revenue in the first period, and in a minor degree in the third, is owing to the famine prices of Fusly 1233 and 1234, and Fusly 1242 and 1243. In 1234 Fusly, 5,40,489 acres paid *Rs.* 44,22,742; in 1259 Fusly, 6,76,079 acres paid only *Rs.* 31,66,739.

Total gain.

It is difficult to compute accurately the gain to the cultivator and the consumer from these various causes: but supposing the profit of Government in revenue to be in other districts two-fifths of the whole gain, we think it may safely be assumed that in the present instance it has not been more than one-fourth of the whole. On that supposition the total gain from the outlay of the additional nine lacs of rupees, has already been not less than 105 lacs, or nearly twelve-fold.

The effects of the attention always paid to the irrigation of Tanjore.

255. The following striking passage takes the whole term of our possession of Tanjore, and shows what vast improvement has resulted, not less to the condition and comfort of the people than to the Government revenue, from the steady attention which, in that province, has always been given in a greater or less degree to the works of irrigation. It is extracted from a Report, dated 12 August 1844, by Colonel (then Captain) A. T. Cotton, on the irrigation of the Rajamundry District, when he first brought forward his plan for improving and extending the irrigation from the Godavery river:—

"4. Before attempting an outline of the system of works that would be required to irrigate this district, it will be well to consider what has been done in Tanjore, the cost of the works and their results. When we got possession of that district, it was in a far more advanced state than Rajahmundry is now; there was already something like a system of irrigation, and especially one main work, the grand anicut, built to prevent the Cauvery rejoining the Coleroon: so that the district, or at least those parts of it which were irrigated, were not dependent merely upon the high freshes of the river, as is the case now in Rajahmundry, but received a supply of water almost as long as there was any in the Cauvery. It was, however, all in a very imperfect state, as is shown by the returns of produce, which in different years varied 50 per cent. according to the seasons; many tracts were not irrigated at all; many were not drained; much water of the Augunda Cauvery flowed to waste by the Coleroon; there were very partial embankments to the rivers, and not the trace of a passable road through the district. Soon after the assumption of the country, the grand anicut was raised; by degrees, innumerable small works, such as sluices, &c., and new channels, were executed; the river banks were extended and strengthened; raised roads, with small bridges and tunnels, were constructed; the ferries were put in an efficient state, many large works for the better distribution of the water within the district, and the control of the level of the beds of the rivers were added; and at last two new anicuts were constructed on the Coleroon to prevent the escape of any water to the sea, when it was wanted in the district. During the 40 years that these works have been constructing about 32 lacs of rupees have been spent on the irrigation, or *Rs.* 80,000 a year; allowing that one-half of this would have kept the works in repair, the improvements have cost 16 lacs, a most insignificant sum compared with the population of the district, its revenue, and the effects produced. It amounts to about 1⅓ rupee a head on the population, it is equal to one-third of one year's revenue, and it is less than one year's increase of revenue, if the first years of the period are compared with the last. The average yearly revenue of the first four years of this country was 31 lacs; the average of the four years ending in 1839, which is the last year I have an account of, is 47½ lacs. Still more insignificant does the expenditure appear compared with the saleable value of the lands of the district; which, calculated from the average price obtained from about 60 estates sold in all parts of the district, was in 1839 about 260 lacs of rupees, and of this about 100 lacs had been added in a few years, so that probably the landed property of the district had been increased in value during these 40 years, 150 or 200 lacs. That the foundation of all this improvement was the attention to the irrigation is perfectly evident to all those who are acquainted with the district; and there is no other way of accounting for the fact that such improvement has taken place while every other district in the Carnatic has fallen off. Circumstanced as the eastern side of the Peninsula is with respect to the rains, it is impossible that any considerable improvement can take place, unless the irrigation is attended to; while the crops are dependent upon the local rains which are so extremely uncertain, almost the whole population must necessarily be employed in cultivation. Few countries in the world are more liable to the destruction of the crops by drought or floods; perhaps none in the world more sure of abundant harvests, if proper attention is paid to irrigation and drainage. The total quantity of rain in the Carnatic is in general very deficient, being only on an average about 48 inches; and even this falls with the greatest irregularity, almost always coming in violent bursts, with long intervals; a fall of five inches in a night is very common, and I have

have known 10 inches fall in one day, and a fortnight afterwards 12 inches in 36 hours; nearly half the supply of an average year thus coming within a fortnight. It is on this account that Tanjore, which alone has been properly attended to, has so remarkably advanced; while the other districts, in which the irrigation has not even been kept up, have retrograded. It may be asked how much of this improvement has been owing to the revenue management; the answer is, the whole of it; for undoubtedly the finest system of irrigation possible would avail little, if the district is mismanaged, but on the other hand the ablest Collector can do little unless his district is supplied with water. But the superior revenue management of Tanjore has been especially shown in this very point, that the Collectors, I believe, without exception, for 40 years, have considered the irrigation of the first consequence, and have most diligently and ably watched over it."

* * * * * *

"If we take the increase of revenue in Tanjore at 16 lacs, and consider it to have been progressive, as it has been upon the whole, the total additional revenue in 40 years, was 320 lacs, and the total irrigation expenditure 32 lacs."

Further details of those effects.

256. We give the foregoing as it stands; it is lucid and conclusive by itself, and needs no remark from us. The following passage, taken from the same officer's second report on the same subject, dated 17 April 1845, gives some more details of the comparison, and of the happy effects of the steady attention paid for so many years to the irrigation of Tanjore, obtained too at a cost quite insignificant in comparison:

"The revenue of Rajahmundry is now just what it was 40 years ago; viz., 19 lacs. That of Tanjore has almost regularly increased from 31½ lacs to 47½, being an increase of 16 lacs per annum, or 336 lacs in 42 years, showing the difference between a district of inferior advantages, but wisely managed, and one of greater capabilities, but allowed to go to ruin for want of a liberal expenditure in its irrigation.

* * * * * *

"But this improvement in Tanjore has been an advance upon a state in which the resources of the district had already been developed to a very considerable extent. The grand anicut, upon which the irrigation of the district mainly depends, had been constructed ages before, and multitudes of channels and works of masonry were in use at the commencement of this century.

"In Rajahmundry, nothing at all had ever been done to lead the water from the bed of the Godavery upon the country; and, excepting two or three small channels to lead off the water in the high freshes, the district was wholly unimproved. Yet upon that state of things, 42 years of peace under our Government have done nothing for the district; and with the same extent of delta land nearly, and a much greater extent of good high lands, the district now produces 19½ lacs, while Tanjore, with much inferior capabilities, yields, with much less hardship to the people, 47½ lacs.

"The statement of produce in Tanjore shows much more distinctly the progress of things and the cause of its improvement, because the revenue, as before observed, fluctuates with prices. The last column, showing the amount per cent. which the fluctuations in each five years bear to the average produce, is the most striking proof of what may be effected by due attention to the irrigation. The seasons are now just as variable as they were 40 years ago, yet the fluctuations have been gradually reduced from 52 per cent. to almost nothing. What can have caused such a change as this, but the due application of the water of the Cauvery? and can it be imagined that if the same wise and liberal system had been adopted with respect to the Godavery, something like the same effect would not have been produced?"

We cannot but add that it is very much to be regretted that these and the other valuable report and papers connected with the Godavery improvements are withheld from general circulation. They are documents with which every officer of the revenue and the Engineer's Departments ought to be familiar; but they still remain, with many other most valuable and instructive documents, locked up in the Records of the Board of Revenue.

The new works on the Godavery river.

257. The next instance which we will take is that of the Rajahmundry district itself. In all the foregoing cases a great part of the work done must be considered as directed only to the maintenance and improvement of existing works. In Tinnevelly, as already said, this was emphatically the case; the works consisted of the careful repair of tanks and channels, and even among improvements there were few works of any magnitude at all. In South Arcot and in Tanjore the principal works which conduced to the striking results noticed, viz., the two anicuts on the

Coleroon river, were indeed new works; but even their design was only to render existing works more efficient, by giving them a more entire command of the waters of the river. The instance now before us is of a different character, viz., a case in which the object was to give irrigation to a tract of country not possessing it at all before, except to a very limited extent, and of a very precarious and uncertain kind.

The Godavery, like the Cauvery, flows to the sea through a flat alluvial delta; and this tract has been for many years partially and imperfectly irrigated from the river; but the irrigation had never been laid out on any comprehensive plan, and of late years the works had been almost wholly neglected. The revenue was declining, under the operation of a combination of causes, of which this neglect of the works of irrigation seems to have been the chief; and while Tanjore under the beneficial effects of the lately constructed anicuts was paying with ease a revenue of 45 lacs, and annually increasing in wealth, Rajahmundry, of similar extent, with a far more fertile soil, and inferior in no one natural advantage, was paying with extreme difficulty a revenue of 19 lacs, and its people were in the lowest state of poverty.

Origin of the project.

258. So long ago as before the close of the last century, an Engineer (Mr. Topping) had observed the facility with which the Godavery might be made to irrigate the districts on its banks, and had brought to the notice of Government how desirable it was to throw an anicut or dam across the river, so as to raise the water, and thus make it available for that purpose. The project was allowed to sleep for half a century, but in the year 1844, the district and its revenue being in the declining state already noticed, it was again taken up. The Civil Engineer Captain A. T. Cotton, first made a general report (12th August 1844) on the feasibility of the project and the probable results; and having been directed to collect and submit more specific information, he made a second and more detailed report on the 17th April 1845, with detailed estimates of the cost of an anicut across the Godavery river, and a more general statement of the probable cost of a system of channels and other works in connexion with it, for the distribution of the water. The project received the approval of the Government, and ultimately of the Court of Directors; and the construction of the anicut, the only part of the works at first sanctioned, was commenced early in 1847.

Nature of the undertaking.

259. The undertaking was a gigantic one; a river exceeding two miles in actual width, besides the islands which at that point divide it into four branches, and running over a bed of pure sand of unknown depth, was to be arrested in its course by a dam 12 feet high thrown across it; and a large part of its waters was to be diverted, and distributed over an extent of 3,000 square miles, by means of a net-work of channels, each one of which must not only be taken at that elevation which would enable it to perform its allotted part, in conjunction with the rest in bringing the whole tract of country under irrigation, but must be adapted as to size and gradient, to convey exactly the quantity of water required, and no more. And all this was to be done in a country where such works had never been heard of before on a scale of any magnitude, or at least only by tradition, and to be effected by the agency of workmen most ignorant and unskilful, who had to be taught almost everything, with a very scanty number of skilled or professional Superintendents, and where almost all the means of abridging or facilitating human labour, if obtained at all, must be fabricated on the spot by means of the same defective agency. The difficulties encountered in the prosecution of the work from the combination of all these unfavourable circumstances, can certainly be fully realized only by those who had a part in the task of overcoming them; some glimpse of their character and amount may be obtained from Colonel Cotton's reports. But our business here is not with the difficulties of the undertaking, but with its cost and its results.

The cost of the works.

260. Captain Cotton's estimate for the works amounted to 12 lacs of rupees, distributed as follows:—

The anicut, with locks, sluices, &c.	5 lacs.
Embankments to the river	1 „
Irrigation channels	2 „
Drainage works	1 „
Sluices, locks, and other small works of masonry	1 „
Roads and bridges	2 „
TOTAL	12 lacs.

But

But his more accurate estimate for the anicut itself amounted to *Rs.* 4,75,572. He supposed that the whole of the works would be completed in five years; and he calculated that at the end of the first 10 years the works would have afforded a net surplus income, above the average revenue of the district in the preceding 11 years, to the aggregate amount of *Rs.* 26,80,000, after deducting their first cost and repairs.

The completion of the works has required a longer time than was then anticipated, partly from delay in obtaining sanction for the channels and other works of distribution, partly because the extent of the operations necessary was found to be larger than was at first computed, and partly in consequence of the very insufficient means placed at Captain Cotton's disposal for laying out and planning the channels and other works. The cost too has been larger than was expected. The work had not proceeded far before it was found that the anicut would cost more than the estimate; the stone quarries turned out to be deceptive, and the material could not be laid down at the price supposed; a larger quantity than the estimate provided was found to be necessary; and lastly, a more finished and substantial style of construction was adopted. Upon the recommendation of a Committee appointed to consider the question, the Government in February 1849 sanctioned a supplemental estimate for the anicut, to the amount of *Rs.* 4,07,506, in addition to *Rs.* 5,03,703 already expended; and in the same month of 1851, a further sum of *Rs.* 65,742 was added for the purpose of extending one end of that work. Thus the total estimated cost of the anicut itself became *Rs.* 9,76,951, and that may be taken as its actual cost. The total expenditure on all parts of the project, up to the present time, is about 13 lacs; and it is calculated by Colonel Cotton that about 11 lacs may still be required; making 24 lacs for the whole system of works, including a most important line of navigation, and a lac and a half of expenditure on roads.

The results hitherto in increase of Revenue.

261. In exhibiting the results of this project, we will first show those already realized in comparison with the expenditure up to the present time, and then state the very much larger advantages which we are thereby fully warranted in anticipating, when the whole of the works shall be completed and in actual operation. And here we must observe that a comparison of the expenses and returns up to the present time is very unfair to the project, for two reasons; 1st., because the total cost of the anicut (a work which will supply the means of irrigating the whole tract) is now shown against the gains from a very small part of that extent, in consequence of the present incompleteness of the channels for distributing the water; 2d., because the large sums expended even on the works of distribution, in the last year at least, have not yet had time to give a return in revenue, and yet their whole cost also is included on the debit side. But even viewed under these disadvantageous circumstances the benefits from the work are seen to be very great; we will first take the whole revenue of the district, as shown in statement 1, in Appendix (D.) It is there seen that on the average of the 11 years preceding the commencement of the works, the whole land revenue of the Rajahmundry Collectorate was *Rs.* 19,08,129; and even that is too favourable a statement, for in the last two or three years of that period, the revenue of parts of the district had improved greatly, in consequence of the clearing out of some of the old channels, previously very much choked with deposit. In 1847 the work at the anicut commenced, and the revenue instantaneously felt the benefit of it. In that first year the collections were larger than in any one of the preceding 11 years; and each of the succeeding six years has shown an advance above the preceding one, with the exception of the single season 1849–50, in which there was a destructive flood in the Godavery; and even in that year the collections exceeded those of any one of the 11 years before the anicut was begun. Nor is this all; in the very first year of the works, and in every subsequent year, the increase of revenue above the previous average exceeded the sum expended on the works, so that the net revenue, after deducting the amount of that expenditure, has been actually greater in every year, even while the works have been in progress, than the average of the antecedent 11 years. And up to the close of the revenue year 1850–51, with which the statement closes, the aggregate amount of such net gain was no less than *Rs.* 6,89,391. The total expenditure on the works had been *Rs.* 12,65,361, and the total increase of revenue above the previous average was *Rs.* 19,54,802; leaving a net surplus gain, as already said, of *Rs.* 6,89,391.

The cause of the immediate large increase of revenue.

262. This striking fact deserves special notice. To what are we to ascribe the instant rise of revenue and the sudden spring of prosperity of which it is the index, taking place immediately on the commencement of the works. It could not then be wholly the effect of irrigation, for in the first year the benefit in that way must have been very small; and even now, the increase of irrigation, large as it has been, is not sufficient to account for the whole gain in revenue. Another cause then must be sought, and we believe it may be found in the condition of things repeatedly noticed by Colonel Cotton, viz., in the vast stimulus given to industry and production by the employment of labour and the circulation of capital, involved in the expenditure of large sums in a depressed and poverty-stricken district. This is an important element among the incidents of such undertakings as the present, which has been too little recognized; Colonel Cotton indeed dwelt upon it in his very first Report on the Godavery irrigation,* and his expectations of profit from the works were framed with reference to it; but in general it has been entirely overlooked. In the present instance indeed its operation has been increased by the fact that a large Madras firm which has a sugar factory near Rajahmundry, has been enabled very much to augment its purchases, as the extension of irrigation made it possible to extend the cultivation of the cane. But though this fact explains the otherwise strange circumstance that the increase of revenue exceeds the sum expended, it does not weaken but confirms the great and important fact, that the outlay of capital in a district in the employment of labour, whether by Government or by private persons, produces an immediate and powerful effect on the revenue. Practically indeed this has long been known, every Tahsildar in the country is well aware how much more easily his collections come in years when merchants are making large advances in his talook for sugar, indigo, cotton, &c., but it has not been adequately recognized by the Government, or seen in its real bearing on the outlay of money by Government on the works of irrigation or on the roads. In future it is to be hoped it will not be lost sight of, in that relation.

Probable future results of the works.

263. We will now briefly state what appear to be the future prospects of benefit from the anicut. We have already said that Captain Cotton computed that at the end of 10 years, it would show an aggregate net gain in revenue, of *Rs.* 26,80,000 over and above all charges, in excess of the average revenue prior to the improvements. We have seen that one of the elements of this calculation, viz., the cost of the works, was very materially under estimated; and the period for the completion of the works being much protracted through the causes already noticed, another element of the calculation was modified, for this delay necessarily postponed the time when the whole system of works would be in operation. But though the estimate was thus disarranged, there still seems good ground for believing that the anticipation of net results will not be found to have been too sanguine. Captain Cotton's calculation in 1845 was as follows:

Expenditure

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* The following passage is taken from the first report on the irrigation of Rajahmundry:—"In examining the question of the propriety of such an outlay as this, there is one point which I consider deserving of particular attention; we are apt, generally, to think of a Government expenditure as if it were precisely similar to one made by a private individual; but in countries circumstanced as these are, there is a vast difference, and especially in this particular case of Rajahmundry. A lac of rupees cannot be spent in any district without a large portion of it immediately finding its way back to the treasury; but in this district, which is now suffering such difficulties from the immense diminution of specie, probably the greater part will be paid back in the course of the year. This additional circulation will enable many to pay their kists who would otherwise not have done so; and perhaps there would be little more difference made by its disbursements, in respect of the state of the treasury, than that such portion of the population as would otherwise have been either not at all employed, or to little effect, would thus be usefully occupied. During three or four months the great bulk of the population are employed to very little purpose, where there is almost literally no capital to enable the landowners to make improvements; but an expenditure of three or four lacs a year would put life and activity into the whole district. That part of the population which are just now, from the impoverished state of the district, a dead weight upon the rest, from want of employment, would be provided for, and the supply of specie would give a great stimulus to the remainder. Indeed, I would state it as my opinion, that, independently of the ultimate returns, the treasury would not be at all the poorer at the end of the year for such a disbursement, in the present state of the district; such an outlay seems to me more nearly allied to a loan from a landlord to his tenant, to be expended in improving his farm, than to a simple expenditure." The revenue accounts of recent years show how singularly accurate this prediction was. Some later remarks on the same subject will be found in Appendix (D.) to this Report, para. 3 (near the end), and 10 and 11.

Expenditure in the next five years (*i. e.* dating from the commencement of actual work) to put the Delta in order -	12,00,000
Ditto, annual repairs from that time for five years, at 1 per cent. yearly, on 24 lacs of revenue - - - - -	1,20,000
Total Expenditure - -	13,20,000
Increase of Revenue in 10 years at an average of four lacs yearly - - - - - - - - - - -	40,00,000
Net gain in the next 10 years by a liberal expenditure -	26,80,000*

The calculation at present may be stated as follows :

Outlay.

Actual expenditure up to the present time (five years) -	13,00,000
Estimated further expenditure in the next three years -	11,00,000
Ordinary repairs and minor improvements for two years, at *Rs.* 1,20,000 yearly - - - - - - - - -	2,40,000
Total - -	26,40,000

Income.

Actual increase of revenue up to the present time - -	19,54,802
Probable increase during the next five years at an average of seven lacs yearly - - - - - - - - -	35,00,000
Total -	54,54,802
Probable net gain in 10 years from the commencement of the works - - - - - - - - - -	28,14,802

It will be seen by statement 1 in Appendix (D.) that the excess of collections in the single year 1850–51 over the average before the works were begun, was five lacs and three quarters; the revenue has largely increased since the very first year of the improvement, and there is no doubt that it will continue to rise at an accelerated ratio. Not to mention other channels and works, one single work constructed this year, the Ganarum Aqueduct, will convey water to a tract of country of 30,000 acres, which alone will yield a revenue of little less than a lac of rupees. We feel sure, therefore, that we are quite safe in assuming seven lacs as the average yearly excess of collections during the next five years, over the average before the works were commenced; we fully believe that in point of fact it will be still larger. If then Captain Cotton largely under-estimated the cost of the project,† there seems good reason to believe that he also greatly under-rated its benefits; and that after deducting the increased expenditure, the net gain at the end of 10 years, will be even larger than he expected.

Probable eventual results, when the works shall be in full operation.

264. And if we carry our views further, and contemplate the probable eventual results, we cannot but feel persuaded that his largest anticipations will be realized, both as regards the direct profit in revenue to Government and the vast accession of wealth to the people. We cannot forbear to glance hastily at this promising future.

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* *See* the second report on the Delta of the Godavery. Besides the above, Captain Cotton also took credit for the prevention of an annual loss of revenue to the amount of *Rs.* 90,000, which, as he inferred from the accounts of past years, would take place in the 10 years in question, in the absence of the projected works. The Board of Revenue do not deny the justness of this estimate; and they specially notice the then declining state of the revenue as one principal reason in favour of undertaking the works. But we take no account of this part of the calculation, because we do not feel ourselves in a position to speak confidently upon it, and the amount may be open to dispute. We confine ourselves to the increase over the previous average revenue; but it is evident that this is to take too limited a view of the results.

† It is an apt illustration of the mode in which undertakings of this nature are regarded at Madras, that while the Committee who investigated the causes of the insufficiency of the estimate, and the probable cost of completing the work, received the thanks of the Government, and very deservedly, there was nothing but severe censure for the officer who devised the project, and superintended its execution, at enormous and incessant labour to himself, both mental and bodily. No matter that he had given a net addition of several lacs annually to the revenue, and that he had brought industry, enterprise and wealth, to a community of a million persons, previously poverty stricken and desponding, he had committed the grave offence of making too small an estimate; by an error of judgment which might have been supposed pardonable in an undertaking of such vastness and such novelty, he had represented the money price of all the enormous advantages of the work, utterly insignificant in reality, as more insignificant still.

The tract capable of being watered from the anicut is 3,000 square miles, or two million acres; and there is more than sufficient water for this extent. But as a part of it is capable of being watered also from the Kistnah, by means of the anicut to be constructed at Bezwarrah, Colonel Cotton takes 12,00,000 acres as the actual extent to be irrigated. And out of this there will be water for about 100,000 acres all through the dry season, which will probably be all cultivated eventually with sugar cane, betel, chillies, plantains, and other valuable products. The richness of the soil adapts it admirably for the sugar cane, the cultivation of which has very much extended since the anicut was built; and a Madras mercantile house has a large sugar factory very near Rajahmundry, as already noticed. The growth and manufacture of sugar are likely to increase immensely. Colonel Cotton reckons that after the works have been completed, a yearly outlay of *Rs.* 1,20,000 will be fully sufficient to maintain these works in good order; and adding to this sum *Rs.* 50,000 for the yearly cost of the engineering and Maramut establishments, being on a liberal scale and at an outside estimate, and the further sum of *Rs.* 1,20,000 as the interest at 5 per cent. on the capital invested, 24 lacs, the total annual charge will be *Rs.* 2,90,000, which will give less than four annas per acre as the yearly cost of conveying the water to the land. The increased income to Government is reckoned at only 2½ rupees an acre, though it will hardly any where be less, and will be very much more over a great part of the tract, because a large part of the newly irrigated land will be such as was never cultivated at all before, and never paid anything. Even at that moderate rate, however, the total increase of revenue will not be less than 30 lacs annually; being more than cent. per cent. annually on the outlay, after deducting all charges; and large as this appears, there seems nothing impossible or incredible in it, if we look at Tanjore, which now actually pays with ease and alacrity a revenue of 47 lacs.

Vast gain to the people.

265. And this triumphant success, this magnificent addition to the revenue, is not to be gained by exaction, by trenching on the fair rights of property or industry; on the contrary, the noblest feature of all is that this vast gain to the Government is to be obtained by adding in a far higher degree to the wealth, comfort and happiness of the people. The value of the crop on an acre of dry land does not exceed *Rs.* 6, but that of an acre of rice is *Rs.* 20, and of an acre of sugar cane it is *Rs.* 230; being a gain of *Rs.* 14 an acre in the former case, and *Rs.* 224 in the latter. The gain to the producer therefore, by the improvements in question, may be stated as follows, at a low estimate:

	Rs.
1,00,000 acres of sugar cane and other valuable products at *Rs.* 200 - - - - - - - - -	2,00,00,000
11,00,000 acres of rice at *Rs.* 12 - - - - - -	1,32,00,000
Total - -	3,32,00,000

Reckoning the value of the crops at these moderate rates, and taking no notice of the fact that much of this will be land now altogether waste and unproductive, or of the certainty of the crops under river irrigation, compared with their precariousness at present, we find that the gain to the Ryot is 332 lacs, and if he pays 30 lacs in revenue, he will still be a clear gainer of 300 lacs a year. It is no wonder that the greatest anxiety is displayed to get a share of the irrigation, or the greatest alacrity to use the water when so obtained; nor is there anything surprising in the striking change which Colonel Cotton so prominently remarks on in his later reports, as exhibiting itself in the character of the people, activity, enterprise and life, having taken the place of their former apathy and despondence.

The Samulcottah Channel.

266. In further illustration of the effects of the improvements in Rajahmundry, we will detail the results of particular parts of the whole project; and the first work which we will take is the Samulcottah Channel. This is an entirely new branch taken off from one of the old irrigating channels, called the Toolia Bagah; it is 27 miles in length, and eventally will water 15 villages; but as yet the water has not reached all of them, from the incompleteness of the subsidiary works. The channel was excavated in 1846, at an expenditure of *Rs.* 13,472; its supply was first increased by the operation of the anicut in 1848, which affected the revenue of 1849; the Table No. 2, in Appendix (D.), shows the results, being a comparison of the revenue from the 15 villages concerned, before and after the excavation of the channel. The total sum expended on the improvements was *Rs.* 29,226, spread over five years, but of which *Rs.* 22,000 was spent in the first two years; and

and the increased collections up to the end of the third year far more than covered the whole outlay. But as this channel has benefited by the anicut, we will add to its own cost a share of that of the anicut proportioned to the area watered by it, compared with the whole extent to be irrigated by the anicut, viz. 1-18th, or *Rs.* 11,300. The outlay will then be *Rs.* 40,526; and the increase of revenue in the third year from the first commencement of the improvement exceeded this whole outlay, much of which was in fact incurred after that year. The average yearly collection in the six years preceding the improvements was *Rs.* 25,280; in the fifth year from that time it was more than double, being *Rs.* 51,245; in the sixth year (1851), as we learn from the Collector, it was *Rs.* 56,882. The aggregate excess of revenue in those six years, above the average of the preceding period, was *Rs.* 1,13,876; and the net gain in revenue, after deducting the cost of the improvements and repairs (including *Rs.* 4,217 expended in 1851), was *Rs.* 62,433.

Lastly, to compare the yearly increase of revenue with the outlay. The total first cost, taking as such the whole outlay of the first two years, and the share of the cost of the anicut, was *Rs.* 33,237. The marginal statement shows that the increase of revenue over the average before the improvements, has been larger and larger in each succeeding year as the works advanced; and undoubtedly it will continue to advance, because the minor works for distributing the water are even yet far from being complete. The increase in 1851 above the average prior to the improvements was *Rs.* 31,602, and deducting from this *Rs.* 2,000 as the average cost of repairs, there remains *Rs.* 29,602, being 95 per cent. on the first cost. But the revenue, as already said, is still increasing; and there seems no doubt whatever that in a few years the net amount, clear of the cost of repairs, will reach at least *Rs.* 38,000, being more than 111 per cent. annual return on the first cost.

	Rs.
1846	5,206
1847	10,813
1848	17,660
1849	22,630
1850	25,965
1851	31,602

267. As another instance, we will take the Woondy Talook. This Talook lies on the left bank of the Godavery, just below the anicut; a part of it is high, while the rest is so low, that being undrained, it has always been liable to much injury from floods. The latter part of the talook was watered by two anicut channels, called the Boopiah and the Apparow Channels, which passed also through the higher part, but at too low a level to be available for irrigation in that part of their course. Both channels had been totally neglected for many years, and were much choked up with deposit. The improvements commenced in 1839 with the clearing out of the old channels, and they have been continued every year. In addition to that clearing out, the works have been chiefly of three kinds: 1st. Constructing locks and dams of masonry across the channels in their passage through the high grounds, so as to irrigate the lands there. 2d. Excavating branch channels to reach tracts not formerly irrigated; and 3d. In guarding against floods in the low part, by embanking the river and forming drainage works. The Woondy Talook.

The following Table shows the expenditure and the results:

1. Years.	2. Collections.	3. Increase of Revenue above Average of the Six previous Years.	4. Decrease of Revenue.	5. Total of Increase at the End of each Year.	6. Cost of the Improvements to the Two main Channels.	7. Total Cost up to the End of each Year.	8. Half debited to Woondy.	9. Expenditure in the Talook.	10. Total Expenditure in the Talook up to the End of each Year.	11. Total Cost of the Improvement.	12. Share of the Cost of the Anicut.	13. Net Profit to Government at the End of each Year.
	Rs.	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*
1833	69,394	—	—	—	—	—	—	—	—	—	—	—
1834	87,982	—	—	—	—	—	—	—	—	—	—	—
1835	64,533	—	—	—	—	—	—	—	—	—	—	—
1836	78,143	- -	- -	- -	- -	- -	- -	1,846	1,846	—	—	—
1837	77,412	- -	- -	- -	- -	- -	- -	988	2,834	—	—	—
1838	37,886	- -	- -	- -	- -	- -	- -	1,907	4,741	—	—	—
Average -	69,223											
1839	84,389	15,166	- -	15,166	795	795	397	3,801	8,542	8,939	- -	C,527
1840	80,677	11,454	- -	26,620	2,505	3,300	1,650	4,508	13,050	14,700	- -	11,920
1841	90,024	20,801	- -	47,421	5,650	8,950	4,475	6,872	19,922	24,397	- -	23,024
1842	93,465	24,242	- -	71,663	485	9,435	4,718	2,729	22,651	27,369	- -	44,294
1843	62,898	- -	- -	65,338	610	10,045	5,022	1,337	23,988	29,010	- -	36,328
1844	95,512	26,289	6,325	91,627	2,920	12,965	6,483	6,090	30,078	36,561	- -	55,066
1845	1,02,062	32,839	- -	1,24,466	2,987	15,952	7,976	2,991	33,069	41,045	- -	83,421
1846	1,08,384	39,161	- -	1,63,627	54	16,006	8,003	2.938	36,007	44,010	- -	1,19,617
1847	1,12,989	43,766	- -	2,07,393	- -	16,006	8,003	3,886	39,893	47,896	- -	1,59,497
1848	1,19,232	50,009	- -	2,57,402	1,190	17,196	8,598	1,458	41,351	49,949	- -	2,07,453
1849	99,995	30,772	- -	2,88,174	13	17,209	8,604	754	42,105	50,709	- -	2,37,465
1850	1,25,000	55,777	- -	3,43,951	983	18,192	9,096	1,154	43,259	52,355	60,000	2,91,596
1851	1,36,662	67,439	- -	4,11,390	- -	18,192	9,096	1,689	44,948	54,044	- -	3,57,346

Results obtained.

268. The total outlay in improving the old channels has been *Rs.* 18,192; but as they water lands in Masulipatam also, half of that amount is deducted as due to that district, and the remaining moiety only, viz. *Rs.* 9,096, is debited to the Woondy Talook. The minor improvements of the various kinds above stated, have cost on the whole *Rs.* 44,948 in 16 years, but the greater part of it, viz. *Rs.* 25,337, in the six years, 1839 to 1844. Turning now to the revenue column, we find that the average yearly collections in six years preceding 1839, when the improvements were commenced, is *Rs.* 69,223, while since that period they have been steadily rising, with the exception of two bad years, when there was much loss, until, in 1851, they amounted to *Rs.* 1,36,662, being nearly double the average prior to the improvements. In the earlier of the two bad years just spoken of, viz. 1843, the cause of the loss was drought, or rather it was the want of an anicut, as there was plenty of water in the river; in the latter year, the cause was an extraordinary flood, or the insufficiency of the embankments.

The anicut first affected the supply of water to these channels in 1850; we will therefore compare the outlay with the results both prior and subsequently to that period. The total excess of revenue in the 11 years, 1839 to 1849, above what it would have been at the average of the preceding six years, is *Rs.* 2,88,174, being more than five and a half fold the whole amount expended on the improvements up to that time; but we must add again, that the real effect is much greater than is thus shown, because year by year improvements were going on and producing fresh increase of revenue, which increase is unduly diminished by being spread over the whole period.

But now to include the cost of the anicut. The area to be ultimately watered by these channels is about 1-15th of the whole tract that will be irrigated by the anicut; and we therefore take 1-15th of the cost of that work, or *Rs.* 60,000, as debitable to them. Add to this, *Rs.* 9,096, the cost of the improvements to the main works and 22,474, being half the amount of expenditure in the talook, and we obtain the first cost of these improvements; the other half of the latter sum is the probable amount of repairs, being at the rate of *Rs.* 1,404 annually. The total first cost of the work, then, is *Rs.* 91,570. The total increase of collections in the two years, 1850 and 1851, above the average prior to 1839, is *Rs.* 1,23,216, or *Rs.* 61,608 a year; and deducting from this *Rs.* 1,404, the annual expenditure on repairs, the net gain in revenue is *Rs.* 60,204, or 65 per cent. per annum on the first cost of the works, including the share of the anicut. But this is trifling compared with what may be expected with certainty in a few years. For from the want of the detailed works for distributing the water over the Talook, which could not be attended to for want of officers and surveyors to lay them out, the water does not yet reach to nearly the whole extent of land which will ultimately be watered by it.

The importance of this case as an example.

269. We have given a somewhat lengthened notice to the works on the Godavery, because their great importance seemed to us to deserve it. They afford a most instructive instance of the vast benefits to be obtained by extending irrigation, and an emphatic encouragement to advance boldly and vigorously in that course of improvement. Even while the works are in progress and far from being complete, and while a large part of their effect is of necessity still undeveloped, the direct return in revenue have amounted, taking each year's increase of revenue in comparison with the whole expenditure up to that time, to above 62 per cent. per annum on the capital laid out;* and there is no doubt whatever that the future returns will be enormously larger. While to the people the change may be described as one from death to life: at so low a point were they before in poverty and indifference, so great is the contrast now in activity and energy. And all this has been obtained, it should be remembered, literally without any outlay, without any sacrifice of income whatever; for in every year of the progress of the work, the increase of revenue has been materially in excess of the expenditure. It would be

* The comparison is here made with the average revenue of the 11 years immediately preceding 1846-47, the year in which the improvements began. But this, as already observed, is unfair to the works, because the improvement of several of the large old channels was commenced several years before, and not only arrested the downward progress of the revenue, but raised it somewhat. A fairer comparison would be to omit the last three years immediately preceding, and take the previous eight, viz., 1835-36 to 1842-43; the average revenue for comparison would then be *Rs.* 18,59,354, and the annual per-centage of direct profit from the works 71 per cent. on the sums expended.—*See* Statement 1, in Appendix (D).

be unsafe to reckon upon an equal measure of success in every instance, for the circumstances of Rajahmundry were peculiarly favourable; but we are bold to declare our firm conviction that there is no district in the country in which a similar expenditure would not be largely remunerative to the Government and a blessing to the people, though not in all in the same degree.

The roads of the district must be improved.

270. In closing our remarks on this case, we may observe, lastly, that there is one essential species of improvement in connexion with improved irrigation works, which has not yet been adequately attended to, and which was neglected in the present instance; we mean the facilitating of the transport of produce. We have seen that in Rajahmundry the additional income every year exceeded the outlay; yet a trifling sum, under *Rs.* 10,000, for the formation of a most important piece of road to connect the producing parts of the district with the shipping port, was once and again refused by Government, on the ground that the expenditure on the irrigation works was so heavy. Had it not fortunately happened that the principal irrigation channels themselves form a valuable line of communication though as yet very imperfect, this policy must greatly have retarded the beneficial effects of the irrigation improvements. No time should now be lost in perfecting the canals for navigation and in forming a system of communication throughout the district.

And the port of Coringa.

The port of Coringa also requires attention. This valuable harbour has hitherto been utterly neglected, and it is no wonder that it has rapidly deteriorated within memory; yet a very small expenditure, and the application of those principles of treatment which have been developed by attention to similar works in England, would restore and greatly improve it. We shall recur to this subject hereafter. Many concurrent circumstances point to Coringa and its port as likely to become hereafter one of the largest and most important centres of commerce in the whole Indian Peninsula.

Remarks on the statement of the results of improvements in irrigation.

271. This seems a suitable place to offer a few observations on the statement given in Appendix (Z.), showing the revenue results of the outlay incurred by Government, during a number of years, in improving irrigation. The statement was drawn up under the orders of the Board of Revenue in the Department of Public Works, with much care and labour; but we have changed its form, and put it in a shape which appears to us more convenient than its former one. It is not a perfect statement, being wanting in some details: but it embodies all the information which the Board could obtain after a great deal of trouble and correspondence; and in all that it gives it may fairly be taken as authentic. It is a point of no little importance that even a commencement has been made in collecting such information; and the reports of each succeeding year may be expected to be more and more complete.

The present statement covers a period of 14 years; viz., from 1836 to 1849 inclusive. It includes all completed works of any magnitude executed within that term, for the improvement of the irrigation; not merely new works, but enlargements and extensions of old ones; a number of even very small works are entered in it. Lastly, we are assured by the Board's Secretary, that it comprehends all works coming within the foregoing description, whether successful or otherwise; and is not in any sense or degree a selection. It includes a number of improvements in connexion with the Godavery anicut, but it does not include the anicut itself, because that was only in course of construction at the time when the statement closes.

A very few works in it have not been profitable; the reasons of this.

272. An examination of this table places the good policy of improving the irrigation in a very striking point of view, even confining our regards to the narrow object of the revenue. Taking as single works one or two entries, each of which in fact refers to several small works, it contains 39 works, of which three only have been unremunerative; viz. Nos. 13, 14 and 27. The first of these three, the Moonunghy Channel in Guntoor District, designed for the irrigation of a certain tract, was never completed, having been superseded while in course of excavation, by the better and more recent project of the Toongabudra Channel (No. 10 in the list), which waters the same land and other besides. The second, the Ivany Tank in the same district, exhibits a trifling loss, in consequence of having been breached in a most unusual flood in the year 1849; the repair of this accident materially raised the average cost of repairs in the few years since the restoration of the tank; but there is no reason to doubt that the work will still be a profitable one.

one. The third work, viz.; the new Iyen Voykal in Trichinopoly District, has been apparently the worst of all; but in point of fact it is not a failure at all, inasmuch as increase of revenue from the work itself was no part of the intention when it was undertaken, but another object, which has been fully attained. When the Upper Coleroon anicut, alluded to above, was undertaken for the benefit of Tanjore, the old Iyen Voykal, a valuable and very productive channel in the Trichinopoly District, taken off from the Coleroon about 10 miles below the site of the proposed anicut, would have been thereby deprived of a large part of its supply of water, unless it had been prolonged upward, so as to bring its head above the anicut. This prolongation is the present work, styled the new Iyen Voykal. The work was a necessary part of the plan for improving the irrigation of Tanjore; and properly the expenditure ought to have been charged against that district; in which case the very large rate of profit from the upper anicut now shown would have been slightly reduced. Thus this channel cannot in any sense be considered a failure, because the very important object with which it was undertaken was fully attained. In point of fact, the revenue from the channel fell off after this improvement (for improvement it undoubtedly was), but for this that improvement is obviously not responsible. Some remarks will be found below (*see* para. 303) as to the probable real causes of this decline.

A large part of the outlay has been enormously profitable.

273. With the exception of the three works above noticed, all the others in the list exhibit a profit in revenue, and some an enormous profit. The following are those which display the highest rates of return on the capital invested, and among them are several of the largest works in the whole list.

DISTRICT.	WORKS.	First Cost.	Average Yearly Outlay in Repairs and Minor Improvements.	Average Yearly Increase of Revenue by the Work.	Average Yearly Net Increase, deducting the Cost of Repairs, &c.	Per Centage of the Yearly Net Gain to the first Cost.
		Rs.	*Rs.*	*Rs.*	*Rs.*	*Rs.*
Rajahmundry -	Samulcottah Channel -	13,472	2,840	13,289	10,449	77 9/16
	Boopiah Calway and other works.	19,259	1,362	18,975	17,613	91 7/16
Masulipatam -	Pullairoo Channel - -	13,713	1,759	27,600	25,841	188
	Apparow Channel - -	8,756	577	23,287	22,710	259 3/8
Guntoor - -	Coochinapoody Tank Channel.	366	459	1,181	722	197 1/4
	Vellatoor Channel - -	7,087	723	7,013	6,290	88 3/4
Nellore - -	Veroor River Channel -	1,751	83	2,393	2,310	132
South Arcot -	Lower Coleroon Anicut and connected works.	74,234	2,855	1,01,641	98,786	133 1/16
Tanjore - -	Upper Coleroon Anicut -	83,401	18,159	1,38,861	1,20,702	144 11/16
Coimbatore -	Pillioor Tank and other works.	6,511	248	5,862	5,614	86 9/16
Madura - -	Improvement to a small anicut on the Vigay River.	2,466	470	2,681	2,211	89 5/8
Tinnevelly -	Teroovengadanadapoorum Tank.	643	- - -	1,048	1,048	163
	Autoor Tank.	3,242	623	3,684	3,061	94 3/8
	TOTAL - - - *Rs.*	2,34,901	30,158	3,47,515	3,17,357	134

Thus the aggregate cost of those 13 improvements was *Rs.* 2,34,901, and the total net annual gain in revenue, after deducting the annual charges, was *Rs.* 3,17,357, being at the rate of 134 per cent. per annum on the capital expended.

And the result of the whole is a very large profit.

274. Of the remaining works in the list, the rate of net annual profit ranges from 3 3/4 per cent. in one case, to 47 1/2 per cent. But it must be borne in mind that in many of those cases which now show the smallest rate of profit, the works have been in operation only a very limited term, and it often takes several years to develope the full effects of improvements of this nature.

Taking the whole of the works in the list, the successful and the unsuccessful, the following is the result: the total first cost was *Rs.* 5,41,116; the total average yearly

yearly net gain in revenue, after deducting charges, was *Rs.* 3,76,737, being a net profit direct to Government at the rate of 69½ per cent. per annum on the cost. This calculation indeed does not include the charge of the Engineering and other Establishments, but if we add 25 per cent. on that account both to the first cost and to the annual repairs, &c., a proportion which we know (*see* Appendix AA.) to be in excess of the actual truth, we still have a clear direct profit to Government of 53¾ per cent. per annum on the outlay. Had there been a more sufficient engineering establishment to make more careful previous inquiries, and to oversee the executive more efficiently, some few of the works in the list might possibly not have been undertaken, and certainly all would have been more cheaply accomplished. But taking the list as it stands, it cannot be denied that the result shown is most satisfactory; a most convincing proof of the value of irrigation, and of the ease with which the resources of the Government as well as of the people may by that means be immensely increased.

The whole expenditure on such works has been very scanty.

275. Before quitting this subject we cannot forbear recording a few observations on the very small amount of the expenditure shown in the statement. During the whole period of 14 years included in it, the sum of the expenditure on the very important objects to which it refers, was no more than *Rs.* 5,41,116 in the whole of the 18 collectorates which possess Government irrigation works, being at the rate of the insignificant sum of *Rs.* 2,137 a year to each district.* And, in point of fact, four of the 18 districts did not participate at all in this niggard expenditure, and among the four is the large and important one of North Arcot, with its 12 lacs of revenue from irrigation. And yet the result of those expenditures even in the narrow aspect of revenue return, was such as to afford the most ample encouragement to a further advance in the same profitable course of investment, had it only been duly attended to. In particular, the two noble anicuts on the Coleroon are among the earliest works of the period. We trust that the new practice of preparing statements of results (and it is to be hoped of publishing them also), will have the effect of attracting more attention to the subject. Indeed we fully believe that this neglect by the Government of undertakings so remunerative, is to be accounted for in a great measure by the extreme paucity of engineers. Superficially and imperfectly as those officers are compelled to perform even their ordinary and routine duties, these are yet quite sufficient to engross all their time, and to leave them none to attend to new undertakings. Here and there indeed an officer is found with energy to take up the investigation of great projects, but this cannot be done except by the neglect of the ordinary duties of his charge, and this is no slight evil, though, perhaps, the lesser of the two. In the case of the Godavery works, not only were the ordinary duties of the division entirely neglected, as we learn from Colonel Cotton's own correspondence, but other divisions were deprived of no inconsiderable part of their far too scanty establishments, in order to provide for carrying on that one undertaking, and still the number of officers employed upon it was far too small, and the progress in consequence very slow.

An examination of this list of works suggests humiliating reflections. The ancient rulers of the country, with resources of science and skill immeasurably inferior to what we can command, raised those numberless magnificent and valuable works, to the possession and the advantages of which our Government has succeeded. It is too evident that had the present powers always ruled, the country would never have possessed these additions to its wealth, or the Government that large accession of revenue, both of which are due to the enlightened intelligence of princes whom we are accustomed to style barbarian.

Losses through the neglect of the works of irrigation.

276. Having given the foregoing examples of great and immediate gain from increased outlay on irrigation works, it might be interesting and useful to quote some instances of the converse; viz. of the actual loss both to the revenue and to the general wealth from the past neglect of the works of irrigation. But we are unfortunately without the materials necessary to carry out this inquiry completely, as there is no record of the former and present revenue from the various tanks or watercourses. The decay of cultivation and revenue under a particular work, indeed, will occasionally attract the notice of the Civil Engineer or the Collector, and

* On inquiry, it appears that part of the expenditure set down as "subsequent repairs" was, in fact, for radical improvements; but even allowing that this is as much as two lacs (and we believe it is much less,) still the total is very meagre.

and the cause of evil will be removed by repair, but commonly no record is made, even then, of the past history of the work, and the circumstances are soon forgotten, even by the officer himself, amid the pressure of other calls on his attention. Very many cases must have occurred in Tinnevelly during the gradual revival of its irrigated revenue which we have described, where the revenue under works had fallen off from their being in need of repair, and rose again when the repair was made, but unfortunately the particulars of those cases have not been preserved. A few instances of this nature which have casually come to our knowledge will be found in a subsequent part of this report (*see* the early part of section 9). The various ancient channels of Rajahmundry, and still more those of Ganjam, would all supply striking examples of vast loss by the neglect of irrigation works, if we were acquainted with the particulars.

Loss to the Ryot.

277. And in connexion with the subject of loss of revenue from neglect to repair works of irrigation, it must never be forgotten that for every hundred rupees of revenue so sacrificed a further loss of fully *Rs.* 150 is entailed on the Ryot; indeed the loss to him is often total ruin, in cases which the Government only regard as a decline of revenue to the amount of a few hundred or a few thousands of rupees out of their hundreds of lacs. For if the tank or channel on which the value of his land depends is permitted to fall to decay, he has no resource, he cannot even, under the existing revenue arrangements, cultivate it with dry crops, for if he did so he would have to pay the full rent for irrigated land, and the ground is therefore left untilled. The following is an instance of this, and not a very rare one: the tank of the small village of Poottiavauripilly in North Arcot District was breached in 1847 so as to be incapable of holding water; it was not repaired till 1851, the delay being chiefly in consequence of the Civil Engineer Department having had no time to visit it, as the Board of Revenue would not sanction a talook estimate sent up. The Ryots, who are poor and hard-working people, deeply felt the loss of their tank, and did their best to get water from wells to cultivate a little of the land. The land thus cultivated has yielded *Rs.* 67 a year, while the average collections prior to the breaching of the tank were *Rs.* 426; the estimate for the repair of the tank was only *Rs.* 750.

Thus, in this petty case the Government sustained a positive loss of above *Rs.* 1,400 in four years, for want of a proper person to estimate for this trifling and simple work. But the loss to the Ryots has been much more heavy; they have been reduced to much actual distress. Indeed, we cannot but think that in neglecting or refusing to keep works of irrigation in repair, the Government commits a positive wrong. The Ryot has invested his labour and capital in the land under the tank or channel, on the implied contract that it shall be kept in efficient repair, and if that is not done, and so his property in the land becomes valueless, we think he may fairly charge the Government with breach of faith.

A recent case of hesitation as to repairing certain tanks.

278. We are induced to dwell more on this point, in consequence of the order recently passed by Government (Revenue Department, 6th September 1851, No. 905), directing the stoppage of the repair of two very large tanks in the Bellary District, which were much damaged in the gale in May last. One of these tanks, that of Darojee, yields an average revenue of *Rs.* 7,524, and the estimated cost of repairing the damage done by the gale is *Rs.* 37,998; the other, that of Singanamully, yields an average revenue of *Rs.* 12,239 to Government, besides revenue alienated as enam, to the amount of about *Rs.* 10,000, being a total of *Rs.* 22,000. The estimate for the repair of the tanks amounts to *Rs.* 60,500. The Right Honourable the Governor in Council considers the amount of the estimates enormous, with reference to the revenue at stake, calls for information whether that amount cannot be diminished, and directs that pending the receipt of orders, on reference hereafter to be made to the Government of India or to the Home authorities, the repairs which have been some time in progress shall be stopped.* The annual revenue from the two works, including that portion which has been alienated or granted to private persons, is *Rs.* 30,000; the Ryot's share of the produce of the land, assuming the proportion before taken, viz., two-fifths to the Government and three-fifths to the Ryot, is *Rs.* 45,000, being a total annual value of *Rs.* 75,000. The expenditure necessary to repair the tanks, that is, to recover

* The details of the revenue and extent of cultivation under these tanks are taken from statements furnished to us by the Collector of Bellary, showing those particulars for the last 10 years.

recover this amount of income now lost, is *Rs.* 98,500 less than one year and a quarter's purchase; and this is withheld.

Large profit to be obtained to Government.

279. Now on this resolution it occurs to remark, first, that on the very narrowest view of the subject, a return of 20 per cent. annually on the amount to be expended, may be regarded as absolutely certain, being the average annual amount actually received during the last 10 years.* And the value of this fact is not affected by the consideration, that the outlay is not for the formation of a new work, but for the repair of an old one; a most extraordinary natural visitation has rendered useless valuable works, yielding a certain amount of revenue yearly, the repair of the injury requires a large sum, and unless it is done the works will continue useless. It may be wished that the accident had not occurred; but having occurred it must be repaired, or the whole revenue from the works must be sacrificed. And it must not be forgotten that even the delay of a year, which, at the least, this order involves, will certainly cost the Government the whole revenue of the year, viz. *Rs.* 20,000, besides a loss of *Rs.* 55,000 to the Enamdars and Ryots.

The rights and interests of the Ryots affected.

280. But our principal object in noticing this order, is to point out how completely it ignores the rights of those Ryots who have a property in the land watered by these tanks. The sanction of the Government of India or of the Home authorities, may or may not be necessary for an outlay actually required for ordinary repairs; the estimates may or may not be exorbitant, as the Right Honourable the Governor in Council is under the impression they are; but what we wish earnestly to call attention to, is the fact that in the consideration of the question of their repair, the question indeed whether they shall be repaired at all, or allowed to lie in ruins, no account whatever is taken of the saleable and heritable property of the Ryots, in the lands dependent on the tanks.

The lands cultivated by means of the water of these tanks comprise about 3,200 acres, and are probably owned by above 600 separate proprietors. They have for ages been irrigated by the tanks, and derive almost the whole of their value from that capability and right of irrigation; they have been inherited through many generations, and have been purchased probably again and again in dependance on that right. If they are now left without irrigation, they become utterly valueless under the existing revenue settlement; and even if the assessment is re-adjusted to suit them as dry land, still at least three-fourths of their value will be annihilated. And yet the question of restoring the tanks is discussed, as far as appears, without any reference to these interests.

We cannot but declare that this appears to us too contracted a view. We think that in all cases of a proposed work the views of Government should not be limited to the direct revenue return, but should comprehend and allow some value to the addition made to the public wealth in the Ryot's share of the increase; and further, that in the case of existing works the Government is in a degree morally bound to maintain them in repair, independently of, and in addition to the consideration of revenue, for the sake of the capital, which, on the faith of their virtual engagement to do so, has been invested in the land under such works.†

Opinions of Mr. C. R. Cotton as to the value of irrigation.

281. The importance and value of irrigation to the prosperity of the country, is a point which is to be decided rather upon argument and proof, than by reference to any authority, however deserving of respect. We will, however, here quote the opinions of two officers, who as well from their character as from their particular position, are entitled to be heard with much deference on this question. In July 1838 Mr. C. R. Cotton, a member of the Board of Revenue, was appointed a Commissioner to report on the cause of the decline of the revenue of the Madras Presidency. In the discharge of this duty he instituted detailed inquiries, and had collected much information when his health gave way, and in the beginning of 1840 he was compelled to relinquish the task and quit India. Before his departure he drew up a general report (dated 20 February 1840), embodying the result of his inquiries as far as they had proceeded; and in that paper he thus records his opinion

* Major Henderson, the Civil Engineer, also states respecting the Singanamully Tank, that during the half century that the country has been under the British Government, it has yielded a revenue to Government of six lacs of rupees, clear of all charges; this again comes to exactly 20 per cent. per annum on the sum now proposed to be expended, viz., *Rs.* 60,500.

† After the above passage was written the repair of the two tanks was ordered, under authority obtained from Calcutta.

opinion as to the essential importance of improving and extending the works of irrigation :—

" 61. There is no country in the world where the items constituting an unfavourable season are so few, and where the means of obviating them are so extensively within the power of the Government. The commanding position in which we now stand in the Peninsula of India, gives us such complete control over the sources and direction of all the streams which traverse it, and which are fed by the various monsoons of the east and of the west, that there is no part of any one district which cannot with the greatest facility be brought under the fertilizing influence of a river; and so long as one drop of water is allowed to run waste into the sea, we must take blame to ourselves for not exerting our best efforts to obviate the evils of poverty or the dreadful effects of famine.

" 62. We have hitherto taken far too limited and illiberal a view of this important object; attempts have been even made to throw a doubt on the policy of extending works of irrigation, as tending to push on the agricultural interests to the detriment of others; but experience, and a moment's consideration, convince us that such an impression originated in error, and has been supported by false notions; and as long as it is allowed to have weight, so long will the advance of the prosperity and revenues of this part of India be seriously impeded.

" 63. By irrigation every species of product is improved, and the labour of tillage reduced, while the amount of produce is increased on any given space; and if the extent of population does not keep pace with that increase, or new varieties of crop do not prevent a superabundance of the grains now commonly cultivated, the decrease of price must be followed by a corresponding decrease in the commutation at which the assessment is noted, whereby both grower and consumer will be directly benefited, and the Government repaid by the extension of cultivation and the improved means of the people."

Opinion of Mr. John Sullivan

282. After Mr. Cotton's departure Mr. John Sullivan, an officer of long revenue experience, was employed to prosecute the inquiry left incomplete by the former gentleman, and he made separate reports on several districts. In his report on Coimbatore the following passages occur, in which Mr. Sullivan states, in strong terms, his opinion of the importance of giving more attention to the improvement of irrigation works, and urges various arguments and proofs in support of that opinion :—

" 3. * * * * * *

The degree in which lands watered from the rivers that are fed by the south-west monsoon are affected in a bad season, depends entirely upon the locality of the rivers. If the sources of those rivers are far to the westward, the lands under them yield an abundant harvest, in what may be the worst of seasons for other lands.

" In Coimbatore, the rivers which possess this advantage in the greatest degree are, 1st, the Cauvery; 2d, the Bhowany; 3d, Allyoor; 4th, Minor Streams; in a less degree, ' the Umrawatty;' partially, ' the Noel.'

" 4. It will be seen from the accompanying statement, that comparing the good season of Fusly 1236 with the very bad season of 1246, there was an actual increase in the latter year in the revenue from the land watered by the rivers ' Bhowany ' and ' Allyoor,' a very trifling decrease only in the revenue dependent upon the ' Umrawatty,' and an immense defalcation from the lands of every other description. With this incontestable proof that the prosperity of the revenue of Coimbatore depends entirely upon the degree in which the district can be brought within the influence of artificial irrigation, it is very extraordinary to hear an opinion from the Acting Principal Collector that it would neither be for the interest of the Government nor the people that any considerable expense should be incurred in improving or extending the works of irrigation. His reasons are, that, as regards the Ryots, a considerable extension of cultivation would, by reducing the prices, be detrimental to the interests of those who did not share in it; and with respect to those who have the means and inclination to extend their cultivation, there appears to be quite sufficient waste land in the district, both wet and dry, which they may bring into cultivation without Government incurring any expense to enable them to do so.

" 5. For nine out of ten years, this fine district has been reduced to a state of extreme misery, simply because the usual supplies of water for the cultivation of the land have been withheld; wherever these supplies have been furnished, the country

country is in a flourishing state, the revenue of Government is steadily increasing, the value of land is enhanced, and there is a total absence of that misery which prevails in every other part of the district; and yet the Collector thinks it would be better to risk the periodical return of this misery, than to do anything that might hurt the interests of the favoured few who thrive upon famine prices, while the bulk of the people are in jeopardy for food,

" 6. The Collector shows that there has been a steady increase in the prices of the principal articles of agricultural produce since the first cession of the province to the British Government, and that the rise of price during the last 12 years is to be attributed to deficiency of produce from bad seasons. Comparing the prices of paddy which prevailed in 1802, when the survey assessment was introduced, and in the five succeeding years, with the prices of the last eight years, there is an increase of upwards of 20 per cent. upon the average in the last period, notwithstanding the very large increase that has been made in the interval to this species of produce, in consequence of improved irrigation. In some of the latter years, famine prices have prevailed; the produce of the country has been quite insufficient for the population; and yet the Collector doubts whether any attempt should be made to increase the quantity of food.

" 7. He seems to forget that, at all events, population is likely to keep pace with increase of produce; that the produce, therefore, of Coimbatore might be made as large and certain as that of Tanjore, without any permanent effect being produced upon prices, famine prices being left out of consideration.

" 8. Every fourth or fifth year the Government lose a large revenue, the people suffer from a scarcity of food, and the cattle perish for want of water; if we are to do nothing to supply this want, it is evident that these evils are irremediable. When the people of Coimbatore are starving, the people of Malabar to the west, and the people of Tanjore to the east, have abundance, simply because their lands are well watered.

" 9. The Collector appears to forget that the waste land, wet and dry, which he speaks of as available for cultivation, cannot be cultivated without water; the more certain the supply of water the better the cultivation, but no supply can be certain that depends upon the falling rains. When dry land is converted into wet, the produce is increased fivefold; if the supply of water be never-failing, this increase is certain, and the revenue of Government increases in nearly an equal proportion.

" 10. It is quite clear, therefore, that instead of standing still, the Government should never relax their efforts until they have succeeded in turning upon the land all the water that is now permitted to run waste to the sea. When all has been done that can be done in this way, by far the largest portion of all the districts, Tanjore alone excepted, will remain dependent upon the monsoon rains for its produce, liable therefore, or rather sure to be visited periodically with scarcity, and not certain in any one year of yielding a full harvest.

" 11. The records will show that there is not a single district, Canara and Tanjore excepted, in which a failure of crops to a certain extent does not occur every year. The people of the Northern districts have suffered severe privations for several successive years. In Ganjam, scarcity prevails at this moment; and yet in that and in other districts, rivers are rolling through them, filled with water for many months in the year, which, if turned upon the land, would ensure them abundance at all seasons.

" 12. In Coimbatore * ' The great fall in the revenue from the Nunjah lands in Fusly 1246 was owing entirely to a deficient supply of water in the river. Lands bearing the assessment of *Rs.* 29,847 were not cultivated, and on lands which were cultivated and assessed at *Rs.* 13,487, remission for shavi was granted to the amount of *Rs.* 11,032.'

" The decrease of *Rs.* 266 was occasioned by lands situated in the village of Munioor, in the extreme limits of the irrigation of the Nunjah Pagaloor (Cavery) Channel, not being cultivated, owing to the want of water.

" The decrease of *Rs.* 7,896 was owing to lands dependent on the Codivairy Channel (Bhowany River) in the village of Perindaloor of Sattemengal Talook, and to lands dependent on the Calingaroyen Channel, not being cultivated, from deficiency of water.

" This decrease of (19,757) arose from lands assessed at *Rs.* 9,529, in 19 villages dependent

* Report from principal Collector, 4th January 1841, Para. 2.

dependent on the Umrawutty River, in the Caroor Talook, not being cultivated, and from remission being made to the amount of *Rs.* 10,228 in lands, the crops in which failed from deficiency of water.

" The decrease of 652 in the assessment of lands left waste in the Talooks of Danaickcottah, Cheyoor and Pullachey, owing to the failure of these (the jungle streams).

" The decrease (22,589) from lands being left waste, and from remissions having been made for withered produce.

" 13. No one who reads these details can hesitate, I imagine, as to the expediency of expending money upon the improvement of the irrigation of this district; it is by such expenditure alone indeed, judiciously made, that we can hope to see it restored to its former prosperous state. The means of making this improvement is obvious; viz. the formation of reservoirs in the most favourable positions for storing the surplus waters of the rivers which are filled from the south-west monsoon, as proposed by the Engineers, Colonel De Havilland and Captain Cotton.

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" 24. Referring to what I have said of the advantage to be derived from a judicious expenditure upon works of irrigation, I beg to enclose a statement which has just reached me from the Principal Collector, and which shows that from Fusly 1209 up to Fusly 1249, a period of 40 years, the sum expended in improving and extending the works dependent upon the ' Bhowany ' and ' Umrawutty,' two of the rivers which are well supplied by the rains of the south-west monsoon, was *Rs.* 1,00,405, and that the actual net gain from this expenditure has been *Rs.* 10,60,340; that is, gain after deducting the charge of the works, and the revenue which the land was capable of yielding when it was dependent upon the periodical rains for its produce. This is an increase of more than fivefold to the revenue, and of more than double that amount to the proprietor."

Minute in Council by the same gentleman.

283. Mr. Sullivan was indeed deeply imbued with a conviction of the necessity of this course to the improvement of the country; and previously to the Report above quoted, he had, while a member of the Council of Fort St. George, recorded a valuable minute in reviewing the Report on Irrigation by Captain A. Cotton, to which we have so often adverted. In that minute, Mr. Sullivan set forth in forcible terms the value of irrigation both to the revenue and to the people; the heavy loss which had been sustained through the long-continued neglect of it by our Government, and the very great advantages which the existing Government possesses, as compared with former ruling Powers, for carrying on such undertakings on a large scale. The whole paper is well deserving of attention, and we print it in Appendix (L.); we quote the concluding paragraphs in this place.

" 53. It was long ago recommended by Colonel De Havilland, an officer of the highest talent and most extensive experience, that this Government should not cease in their efforts to improve the irrigation of the country, until they had turned to account all the water which now rolls in volumes to the sea by the rivers which intersect the Peninsula, and he proposed to effect this object by excavating extensive canals, which should serve at once for purposes of irrigation and communication.

" 54. This recommendation has its foundation in the fact that our provinces prosper or decline, according to the supply of water which they receive. Tanjore, Malabar and Canara are liable to all the incidents which affect the welfare of the other districts, with the important exception of water, of which they have always abundance, the former by artificial works, the latter from the natural rains: in them, therefore, famine and all its concomitant evils, are unknown, and in point of agricultural wealth they will bear comparison with many parts of Europe. No year passes without our having melancholy experience of the contrast which is afforded by the state of the other districts.

" 56. It is plain, from these facts, that an increased expenditure upon the Engineer Department would be the sure means of filling the public Treasury. I am persuaded, therefore, that the attention of the Government cannot be directed to a subject of greater importance; and that it would be wise, without delay, to investigate it thoroughly, with a view to the undertaking of all such works as promise results equal to what have followed from the construction of the anicuts in Tanjore.

" *P.S.*—

"*P. S.*—Since the preceding sheets were written, the report of the Collector of Tinnevelly upon the settlement of that district for Fusly 1848, has been submitted. It appears that the revenue lost in that year from deficiency of water in the Nunjah lands alone was *Rs.* 1,58,471. This example is of itself sufficient to show how necessary it is to the finances of Government that every effort should be made, and made without delay, to put the works of irrigation in the most efficient state, particularly that we should take measures for storing up the water which now runs waste at one season of the year, in order that we may have the means of making up for deficient supplies at other seasons."

Beneficial effects of irrigation;

284. In concluding our remarks on the general subject of irrigation, we will only add a few considerations as to the national benefit from such works; and first we will look at the actual result on a large scale, comparing the Province of Tanjore with any other district. The soil of Tanjore is not naturally fertile; it is a sandy alluvium, and towards the coast especially, it contains a great deal of sand. The district contains under 4,000 square miles, and though the assessment is lighter than elsewhere throughout the Presidency, it yields a land revenue of 40 lacs annually, and contains a population of nearly 1,700,000 persons, and that in more wealth and comfort than is to be met with in any other part of the Presidency, except Canara and Malabar.

Comparison of districts.

The district of Chingleput is also on the coast, and the soil not greatly different from that of Tanjore: it is lightly assessed compared with the adjoining districts, and enjoys the great advantage of being close to the large market of Madras. The extent is 3,000 square miles: it is not by any means without irrigation, but is very far inferior, in this particular, to Tanjore. It yields a revenue of 10½ lacs, and contains a population of 583,460 persons.

Again, take the inland district of Cuddapah, its extent is 13,000 square miles; but, perhaps, a sixth of this is mountain. The soil generally is good, in some parts very rich, and it is not altogether destitute of the means of irrigation. The land revenue is 21 lacs, and the population is 1,450,000.

The following Statement shows the three districts in comparison:—

DISTRICTS.	Extent in Square Miles.	Land Revenue.	Population.	Revenue per Square Mile.	Population per Square Mile.
		Rs.		*Rs.*	
Tanjore - - - - -	3,936	40,00,000	1,700,000	1,000	438
Chingleput - - - - -	3,000	10,50,000	583,460	350	195
Cuddapah - - - - -	13,000	21,00,000	1,450,000	161	111
Cuddapah, deducting Mountain -	11,000	21,00,000	1,450,000	190	131

These figures cannot be depended on for strict accuracy, but they are sufficiently near the truth to afford a fair comparison. It is seen that Tanjore yields a revenue for every square mile of its surface, nearly three times as large as Chingleput (which is itself a favoured district), and more than five times as large as Cuddapah, while it maintains a population nearly two and a half times as dense as that of Chingleput, and four times as dense as that of Cuddapah; and the larger revenue is paid with more ease in Tanjore than the much smaller revenue of the other two districts, and leaves far more to the people. This superiority of Tanjore can be ascribed mainly only to one cause; viz., that capital to a vast amount has been, in the course of ages, invested in it, in bringing water to irrigate its lands.

Such undertakings benefit both the Government and the people;

285. And such investment of capital cannot but be profitable both to the Government and to the cultivator of the soil. We have seen above, that on the average of a considerable number of works, costing on the whole about 5½ lacs of rupees, the clear annual return of revenue to Government has been 71 per cent. on the outlay. But we will suppose that the return in revenue is much smaller, that it is no more than 25 per cent. on the outlay (and there is a vast field for the expenditure of money on the formation of works which would pay more than that), even on this supposition the profit is very great. It may safely be assumed that for every rupee of revenue paid to Government, the total value produced is not less than

than *Rs.* 2½; therefore an increase of revenue to the amount of 25 per cent. represents an increase of produce: in other words, an addition to the national wealth to the amount of 62½ per cent. on the outlay. Now when it is remembered that of the total area of the Madras territories, only one-fifth is cultivated; that of the whole cultivation only one-fourth is irrigated; that millions of acres of good land require only water to make them richly productive; and that immense volumes of water, which might be turned to this use, now flow to waste into the sea; when these facts are considered, some idea may be formed of the vast extent of that field of improvement which is before us.

Largely add to the revenue;

286. It is universally allowed to be judicious in a landlord in England to lay out money in draining, or otherwise improving his property, if he can get a proportionate increase of rent; and those landlords are looked upon as wise and prudent who even borrow money at five per cent. to expend on such improvements, when there is a reasonable probability that the outlay will return eight or ten per cent. Now, in this Presidency, the Government are in the position of landlord as regards the irrigation works; they and they only in general can undertake the construction of such works, and there are vast numbers of undertakings, to a large amount, which would return, not 10 per cent., but 30, 50 and even 100 per cent. directly into the Treasury, besides a vast addition to the comfort and wealth of the community, in advancing whose prosperity the Government has an interest (not here to speak of the duty), which does not exist in the case of the English landlord.

And multiply the produce and the value of the land.

287. Again, at a very moderate computation, irrigation quadruples the produce and the value of land; and thus though acre for acre somewhat more labour is required, yet food is raised at less cost of labour, and a larger fund is left, after paying the cost of production, to be expended on other articles of comfort and convenience besides food. Then the comfort of the people at large increases, new wants spring up which were unknown before, and new branches of industry arise to minister to those wants. Thus a market is created for the surplus produce, and the producer and the consumer mutually profit by each other's prosperity; and this process can go on to an unlimited extent; for the power of consumption is limited only by that of production, the necessary conditions being that the producers of all kinds shall be placed within reach of the consumer by good communications, and that labour shall be free. Thus capital accumulates, and with the accumulation of capital come the love of peace and order, activity of invention, the cultivation and enlargement of the mind, the fine arts, and, in a word, civilization.

Irrigation tends to prevent famines.

288. But, in speaking of the benefits of extending irrigation, we must not omit to notice its efficacy in preventing famines. We have already pointed out the happy peculiarity of the Peninsula of India, that all its principal rivers have their sources under the influence of the south-west monsoon, which never fails; and so their waters, if duly turned to account, afford the means of preventing those distressing scarcities which would otherwise arise from the frequent, entire or partial failure of the more uncertain north-east monsoon. In such times of dearth, the irrigated districts are not only comparatively exempt from distress themselves, but are the resource of all the country around. The drought of 1833 affected, in some degree, all the districts east of the Ghauts, though not with the same violence in all; and thousands of persons in that year, as well as in the scarcity of 1824, left their homes and their lands in the neighbouring districts of Salem, Coimbatore, and the inland parts of South Arcot and Madurâ, and even North Arcot, and betook themselves with their families to Tanjore and Trichinopoly. There they remained for years, and many, probably, have not yet returned to their own villages; and the benefits of the abundance there might have been extended to far greater numbers, but for the badness of the roads. People were dying by the roadside in hundreds in Salem and Coimbatore districts, of sheer destitution, while the price of grain was not nearly doubled in Tanjore, and yet it could not be conveyed to the relief of those districts because of the cost of transit.

The late famine in Guntoor.

289. But it was in Guntoor that the effects of that terrible season were most severe; and though that time has long passed away and the district is recovering from its effect, it will not be uninstructive to consider briefly what those effects have been on the wealth and happiness of the province, and the revenue of the Government.

The

The district of Guntoor lies on the south bank of the Kistnah River; its extreme breadth north and south, is about 80 miles, and its greatest length east and west, about 116 miles, and it contains an area of 4,700 square miles. One-fourth of the surface may be taken as hill and jungle, one-fourth as sand and poor soil, while the remaining half is extremely rich land; being situated on the confines of both monsoons, this district receives a full supply of water from neither; but on the other hand its soil is of such a nature as to require less moisture than ordinary. The supply of water generally during the dry season is scanty, even for domestic purposes; while in a large part of the district (viz. in the rich black cotton soil), wells are useless, as the water is brackish and undrinkable. The gradual slope of the country from an elevated centre, is favourable to the construction of tanks for irrigation, and the large number of ruined tanks in all parts of the country indicate that formerly the extent of irrigated land was considerable; at present it is only four per cent. of the total cultivation. Till within the last eight years the district was almost wholly under large Zemindars, and the destruction of the tanks is owing to the neglect by those proprietors.

Vast destruction of life.

290. In 1832 the north-east monsoon failed throughout the whole Presidency; but the failure was felt with most severity in Guntoor, where it produced all the calamities of famine. The Population Returns of the district for a period of years, are given in the margin, as obtained from the Collector. In Fusly 1241 (1831–32), the population was 512,000; in the following year it was only 357,038, and in 1833–34 it fell to 255,511, being less than half what it was two years previously. Many people left the district during the prevalence of the famine, and removed to the coast districts and to the Presidency; but making every allowance for this, it appears certain that the number of those who perished by starvation, and by the fever which followed the famine, was not less than 200,000. After that period of calamity had passed away, the people who had left the district mostly returned, and the population has gradually risen. In Fusly 1258, it was 487,172, according to the Returns; in 1259 there was no census, probably because a very accurate one was intended in the following year; and in Fusly 1260 (1850–51), the Returns, taken with very unusual care, gave a result of 569,968. Thus, assuming the Returns throughout to be correct, the population has recovered, and is now above what it was before the famine; but these premises are unsound, as the Population Returns were certainly far less complete formerly than now. Prior to Fusly 1256 (1847), very little care was bestowed on them, and, as a matter of course, they were below the truth; in that year the Collector gave them more attention, and the result was an addition of 18 per cent. to the numbers of the preceding year. In 1851 a very careful census was taken under orders from the Government of India, and the result is an increase of 17 per cent. on the Returns of 1849, and this, although the intervening period was one of severe agricultural distress and high prices of grain. It appears certain, therefore, that the increase shown in the statement is in part only apparent, and results from the Returns for the earlier years of the series being incomplete; and it seems a safe conclusion, that even now, after the lapse of 19 years, the population of Guntoor has still not recovered from the destructive effects of the visitation of 1832 and 1833.

Fuslies.	Males.	Females.	Total.
1232	246,413	211,274	457,687
1233	247,699	213,244	460,943
1234	249,316	216,157	465,473
1235	249,105	213,021	462,126
1236	254,292	222,495	476,787
1237	256,826	221,433	478,259
1238	256,514	221,539	478,053
1239	256,483	222,125	478,608
1240	269,684	239,681	509,365
1241	270,433	241,884	512,317
1242	189,659	167,379	357,038
1243	135,417	120,364	255,781
1244	119,876	104,587	224,463
1245	125,004	109,663	234,667
1246	135,582	119,320	254,902
1247	141,794	125,632	267,426
1248	159,630	142,525	302,155
1249	163,051	145,809	308,860
1250	166,697	148,696	315,393
1251	166,573	152,315	318,888
1252	177,480	167,249	344,729
1253	189,027	177,137	366,164
1254	198,148	180,162	378,310
1255	200,049	182,770	382,819
1256	215,605	196,014	411,619
1257	251,432	232,399	483,831
1258	252,793	234,379	487,172
1259	No census taken.		—
1260	279,505	290,463	569,968

Of revenue in all branches.

291. The loss of revenue, and the destruction of property, were immense. Appendix (U.) is a statement of all items of revenue in each year from Fusly 1236 to Fusly 1259. First, to take the Land Revenue: the average collections in the six years preceding Fusly 1242, were *Rs.* 13,94,168; in that year they fell to *Rs.* 6,58,500, and in the following two years they were *Rs.* 6,71,654,* and *Rs.* 5,11,593

* In Fusly 1243, the sum of *Rs.* 3,02,978 was realised at Madras by the sale of bonds belonging to Zemindars; this is omitted in the statement of collections, because not derived from the resources of the year.

Rs. 5,11,593 respectively; since that time they have gradually increased, but the average annual amount up to Fusly 1260, is only *Rs.* 9,86,284, being a loss of *Rs.* 4,07,884 yearly, or of *Rs.* 77,49,796 on the whole. Even this statement does not fairly present the whole case; for all the Zemindaries having fallen hopelessly into arrears, the whole of them were taken under management in Fusly 1245, and since that time the Government collections include all that part of the total or gross collections which formerly went as income to the Zemindar, and in payment of his establishments.

It is singular to observe how uniform the falling off was in all branches of the revenue. In the Sayer (*see* Appendix U.) it was very marked, as was to be expected; the average of the six years preceding Fusly 1242, was *Rs.* 1,01,438; in that year it fell to 64,554, and in the following year to 45,707; in salt, the falling off was from 3,85,000 in Fusly 1241, to 1,60,000 in Fusly 1242; in Moturpha, from 63,000 in 1241 to 23,200 in 1242, and 26,000 in 1243; in Abkary, from 13,232 in Fusly 1241, to 12,341 in Fusly 1242, and 4,808 in 1243; in "sundry small farms," from 13,779 in Fusly 1241, to 9,556 and 4,484 respectively, in the following two years. In some branches the revenue has never recovered itself, but is still below its former standard; salt regained its normal amount the soonest, that is, in about 10 years, being less dependent than the others on the local consumption; it has indeed increased materially above what it was before the famine; this is probably owing to a more vigorous management. The average yearly loss on all these sources of revenue as compared with the six years preceding the famine, is 1,02,784; and the aggregate loss in the 18 years, (after deducting *Rs.* 3,18,000 as the probable amount of the deficit through the abolition of the Sayer duties in 1844) amounts to *Rs.* 15,32,112.

And of private property.

292. It is difficult to estimate the actual loss to the Zemindars and the cultivating classes; but an approximate judgment may be formed. According to the theory of the settlement, the Zemindars were to have 30 per cent. of the gross collections from the Ryots; and thus supposing them to have taken from the Ryot half the gross produce of the soil (an outside estimate), the Government revenue would be 35 per cent. of the gross produce. Considering that during the period of distress the Ryots certainly paid to the Zemindars, and they to Government, a larger proportion than usual of their actual income respectively, it might be safely assumed that the loss was in the proportion above given; but we will take the loss of the Zemindars and the Ryots at only 60 per cent. of the whole, instead of 65, and then the total loss to Government, Zemindar and Ryot, from diminished cultivation and failure of crop, will amount to *Rs.* 193,75,000.

Add to this 18 lacs, the value of cattle and sheep that perished in the famine, and *Rs.* 15,32,112, the amount lost to Government as above stated, in the miscellaneous items of revenue (without attempting to compute the loss to individuals in the various branches of trade and manufacture concerned), and the total loss by the famine, up to the present time, is found to amount to the enormous sum of *Rs.* 2,27,07,000, or above two and a quarter millions sterling.*

The Kistnah anicut to prevent such another famine.

293. The prevention of the famine would therefore have been well worth an outlay of 200 lacs of rupees; and looking at the Government share of the loss only, it would have been worth an expenditure of 85 lacs. It was partly with a view to such prevention that the Government recommended, and the Honourable Court sanctioned, the construction of an anicut across the Kistnah at Beizwarah, with a system of irrigation channels on both sides of the river, viz. in both Guntoor and Masulipatam districts. The whole cost of the works is estimated at fifteen and a half lacs of rupees, and the annual return in the shape of revenue, as computed by the committee appointed to consider the project is, *Rs.* 7,32,059, or 48 per cent.; and even the Government express their opinion, that at the least, the permanent annual gain to the revenue will not fall short of 30 per cent.; far from being a sacrifice, therefore, this project is an investment of capital most profitable to the Government; it will likewise create a vast amount of private wealth, and it may be regarded as certain to prevent the recurrence in Guntoor of such a calamity

* The statistics of Guntoor in Para. 289, are taken from some details of the famine in the Madras Journal of Literature, No. 30, for June 1844, and from the Report of the Guntoor Survey by Mr. Walter Elliot, Commissioner, 18 December 1845. The details of the revenue and population were procured from the Collector.

calamity as we have been noticing; for though it will not entirely obviate the effects of so disastrous a season as that of Fusly 1242, it will greatly moderate them, and reduce them from the horrors of a famine to the mere distress of a scarcity.

294. It is with much pain, therefore, that we find the execution of this most important project indefinitely postponed; and, while we much lament this decision, we cannot but point to the cause of it; viz., the want of Engineer Officers to direct the work, as a most emphatic corroboration of all that we have urged, and have yet to urge, as to the inadequacy of the existing professional establishment, and the necessity of increasing it. Droughts have been observed to recur periodically in Guntoor, and usually the interval does not exceed 12 years; it is now 18 years since the famine, and it is impossible to say how soon another drought may come; it is to be hoped that before that time the anicut will be in operation; and we beg to urge the speedy completion of that undertaking as one both of profit and of humanity. We notice with pleasure that since the Zemindaries came into the possession of Government, a good beginning has been made in restoring the old and long neglected irrigation works of the district, and we trust that this course of improvement will be steadily pursued.*

It has been unfortunately postponed for want of officers.

295. There is in some quarters, however, an opinion adverse to the extension of irrigation works; and as we urge such extension, it is proper that we should here discuss the question. The opinion we refer to is based on the assumption that the quantity of grain now produced is fully sufficient for the wants of the population, as evidenced by the existing low prices, and that any additional production would tend to glut the market; and, by further reducing the price of grain, would disable the cultivator from paying his money-rent, so that in fact the additional means of irrigation would not be made use of. Sentiments to this effect are expressed by the Collectors of Tanjore and Trichinopoly, though qualified by the admission that the introduction of any staple produce other than rice would obviate the objection.

Opinions adverse to the extension of irrigation.

296. First, to look at the subject in an *à priori* point of view, we may observe, that if the argument drawn from the supposed sufficiency of the present supply of grain is good now, it must have been good before the first channel was dug, or the first tank constructed. Then, as now, the existing population certainly subsisted on the food then produced, and it might have been argued then, with as good a show of reason as now, that the increased produce would not find consumers. But what has been the actual effect of the vastly increased powers of the soil caused by the innumerable works of irrigation? Exactly the same that every where follows all improvements in agriculture; the food of a given number of men requires for its production the exertion of a smaller number than before, and those whose labour is thus set free employ themselves on other branches of industry, and so earn a share of the general fund of food. It is certain that the 1,700,000 persons who now inhabit the Tanjore province have not only collectively, but individually, more and better food, more comfort and more intelligence than their ancestors, who were thinly scattered over it in the early ages, or than is now possessed by the inhabitants of the Cuddapah or Guntoor districts; and there is nothing whatever to render this experience of the past inapplicable to the future, or to sanction the admission of a doubt that the cheaper production of food will still create a market for its consumption.

The objection is unsound in reasoning;

297. Again, we would observe, that the actual result of past expenditure on irrigation works does not at all agree with this predicted consequence of future expenditure. All the numerous instances above given of increased revenue by means of such improvements, are forcible contradictions of the anticipation. In the gradual and progressive improvements in Tinnevelly and Tanjore, and not less in the more sudden creation of the means of irrigation by the gigantic works in Rajahmundry, the result has been the same; and if in South Arcot there has been less forward and constant eagerness to take advantage of the water supplied, the causes of this difference are obvious and removable; they are a high assessment and an extreme want of the means of transporting produce.

And is directly opposed to experience.

Such is the result, taking extensive tracts of country in a general view; and if we look at individual works we find no more there to support the objection: every one of the

* The construction of the anicut has since been commenced, and is now in progress, officers having been withdrawn from the Godavery works for the purpose.

the cases recorded in Appendix (Z.) contradicts it, except the single one of the new Iyen Voykal, and the failure there is due to peculiar causes, as we shall explain presently; it seems impossible, in short, that a more emphatic refutation could be given by actual facts to a theoretical argument, than is found in the present instance.

It cannot be denied, indeed, that a false and narrow policy will check the development of the prosperity naturally resulting from improvements of this character, as would happen with improvements of any kind whatever: and there seems no doubt, as a fact, that it has been so checked. But if, even under such disadvantages, these effects have still displayed themselves in so marked a degree, how much more abundant success may be anticipated when those disabilities are taken away. If, instead of the whole return to Government from the works being swept away from the district for ever, a portion of it, even a small portion, is laid out in improving the roads, forming canals for navigation, and improving seaports, the outlay will be abundantly repaid in revenue, through that extension of cultivation which cannot fail to ensue on the increased value thus given to the produce of the soil and the increased employment of labour.

The fear of a want of a sufficiency of labour is contradicted by facts.

298. Another objection is entertained in some quarters against the extension of irrigation; viz., that there is not sufficient labour in the country to execute such extra work, and neither labour nor agricultural stock to make use of extended irrigation if provided; and, when a project of this character is brought before Government, special assurance is required that the people of the villages concerned are wealthy, and able to make use of the water to be supplied.

This fear of a want of labour appears very singular, because it seems to us that it is only necessary to observe what is going on around us, in order to see that such an apprehension is ideal. We would remark, in the first place, that this objection, like the former one, receives a practical refutation in all the instances that we have cited of the profitable result of improvement to the works of irrigation; for, in every one of those cases, labour must have been forthcoming, both to execute the improvement and to cultivate the land. But other proofs may be brought forward: the people of this country are proverbially apathetic and averse to change, and have the character of being, pre-eminently above others, disposed to endure a large amount of suffering rather than seek relief in new spheres of exertion; yet, every year, several thousands leave their native land, their families and homes, and go to the Tennasserim Provinces, the Mauritius and even the West Indies, attracted by wages which do not appear very high. So also there is every year a regular migration of about 4,000 labourers from the mainland to Ceylon, at the coffee picking season, and nearly the whole of this is from Tanjore, the very province in which for many years there has been a larger public expenditure both on roads and irrigation works, and greater extension of cultivation has taken place, than in any other under this Presidency, if we except Rajahmundry, during the last few years; and, though the Meerasedars make great complaints that their labourers leave them, yet the cultivation appears to be increasing every year.* Again, within this country, we find no undertaking delayed for want of labourers; the Hussanoor Ghaut, though in a very unhealthy country, was thronged with people anxious for employment, and the same with all the passes in the Western ghauts; and the sudden demand for the great works at the Godavery was immediately responded to, and at first people crowded to the works in far greater numbers than they could be employed; and, to take an instance of a different kind, the coffee planters on the Shevoroy Hills find no lack of hands to gather their crop. These labourers are obliged to go up the mountain to a climate very ungenial to them, and remain all the week away from their houses, and uncomfortably fed and lodged, yet they cheerfully incur all this for the sake of the 12 annas punctually paid at the end of their six days' labour, and on the Saturday evening thousands of them may be seen wending their way down the ghaut to spend the Sunday at their houses many miles away, and return to their work on the Monday morning.

The real want of the country is not

299. In all these cases, and in numberless others, it has been abundantly proved that the one condition necessary to obtain command of labour is punctual payment; a higher

* Almost all these emigrants return within six months, driven back by the poll-tax payable in Ceylon by all persons resident more than that term in the island. But this fact affects the present question very little, for they are away from March to July or September, which covers the early ploughing and planting, and includes nearly the whole time for road repair and other public works.

a higher rate than two annas (3*d.*) daily has never perhaps been paid for unskilled labour, but this is found quite sufficient if paid punctually and in full. The readiness with which labour is instantaneously supplied whenever wanted, without deranging other employments, and its very low rate of remuneration, convincingly prove its abundance; and we are painfully convinced that the great want of this country is not labour, but the very contrary, employment for labour. In England there is a general feeling in favour of promoting emigration, not simply as a means of bettering the condition of the poor, but on the ground that the population is redundant; but it is certain that if this last proposition is in any degree true in England, it is true in a much higher degree in this country; for the question is not determinable by a mere comparison of numbers with area; it depends solely on the relation of the quantity of labour in the market to the effective demand for it. Man is a marketable commodity, and his value, and therefore his means of earning a subsistence, depend on the relation of supply and demand; and this being the case we have only to compare the rate of remuneration for labour (real not nominal remuneration) in any two countries, to find the relative sufficiency of their population. We say that population is redundant in England and France, and deficient in America and Australia, because wages are so much higher in the two latter countries; and, in like manner, we know that population is still more superabundant in India, because the wages of labour, the real wages in the comforts and conveniences of life, and after making allowance for the difference of climate, are vastly lower in India than in England.

Labour, but employment for labour.

300. It is conceivable that Public Works, and consequent extension of cultivation and other employments for labour, should advance so far as to raise its market rate; but surely that is not a thing to be feared or deprecated. The labourer may claim to share in the general gain; and, not to mention that such a state of things would lead to the introduction of means for saving human labour now unthought of, the hypothesis presupposes that it would be well worth while to pay such advanced rates; this would certainly be the case on public works, and they would provide the funds which would enable all sorts of produce to pay them; but, in point of fact, the probability is that the workmen would earn better wages, without any increase in the price of labour. To explain this seeming paradox, we would observe that, owing to their wretched implements, and still more to their indolent, sauntering way of working, the labourers of this country do very much less work in a day than they might do with but little more exertion. We have mentioned above that a bricklayer, working under a European Overseer, often lays double and even treble the number of bricks in a day that he would otherwise, and it is the same with other sorts of labour; and it may safely be said that a man will do 50 per cent. more work under the eye of an intelligent European Overseer than he would under other circumstances; and this result, we must again remark, is not obtained by severity; on the contrary, the men work cheerfully and willingly under the Overseers. It may be conceived, then, how large an addition will be made to the quantity of labour performed, without any increase in the number of labourers, as the habits of steady working, learnt on the public works, become gradually spread over the country.

Under an active demand, a very large increase would take place in the amount of labour performed by the existing population.

And even this is not all; it is well known that in every part of the country there are whole classes and tribes of the population, not addicted to any settled occupation, but who habitually prey on the community, either by open robbery or secret theft. It may confidently be hoped that a steady demand for labour would have the effect of gradually reclaiming a large proportion at least of these mischievous classes to honest pursuits.

301. As to the absence of agricultural stock or ploughing cattle, the argument scarcely needs a reply. No prudent farmer anywhere maintains more horses or bullocks than he has occasion for; but if his occasions for employing such stock increase he enlarges the number. And it must be remembered that no large and sudden increase of demand will arise; all improvements such as we are contemplating must be gradual, and the enlargement of cultivation in any one year must be atomic compared with the total agriculture of the country. Both individually and with reference to the whole community, the demand for stock will ensure the supply; and it would be as reasonable to suppose that the present number of plough cattle always existed in the country, when the whole region was unreclaimed and covered with forest, as to feel any doubt that the present number will

There is no want of agricultural stock.

be enlarged, with the increase of the demand for them, and of the fund for their maintenance.

The Ryots are forward to cultivate where irrigation is provided, unless prevented by a too high assessment on the land.

302. With regard to the readiness and ability of the Ryots or land-holding class to take advantage of the means of irrigation placed at their disposal, we may again appeal to the numerous cases already adduced, in which the futility of this objection is practically demonstrated. We may be quite sure, indeed, that though less active and enterprising than some communities, the people of this country are not blind to their own interest, and that we have only to open to them a way to profit, or to remove obstacles from it, and there will be no want of readiness to use it; and this is more particularly the case in agriculture, to which the natives of India have a national predilection. It is true, no doubt, that if the Government assessment on the land is so high as to leave no margin of profit to the Ryot, the land will not be cultivated; and from this very cause, thousands of acres of the very best land in the country are now utterly useless and unproductive, and have been so for many years, without benefit to any, to the Ryot or to the Government. But it is equally certain, as has been abundantly proved in Tanjore and Rajahmundry, that if the Government is content with a moderate rate of rent or tax, there will be a forward willingness to cultivate; and there need be no fear that the required capital will not be forthcoming. The people are well aware that cultivation itself will produce the capital; and if it should happen in any case that they have not the means at hand themselves, they will either sublet the land or borrow the necessary funds, wisely and providently trusting to the returns of a grateful soil for the means of repayment; and this is no theoretical or supposititious case; it is one of frequent occurrence, even now.

Exceptional case in Trichinopoly.

303. There is one instance, however, on rather a large scale, in which improvement of irrigation has not had the same satisfactory effect on the revenue which has been observed generally; viz., that of the works of the Trichinopoly district, connected with the upper anicut, the revenue under which exhibits a decline subsequent to the construction of that work, when compared with the years preceding it. As we earnestly advocate the extension of irrigation, on the ground that it is beneficial to the revenue as well as to the interest of the public at large, we thought it proper to make inquiries respecting this exceptional case; and the following is the result.

The Upper Coleroon anicut.

304. The Upper Coleroon anicut, though situated within the Trichinopoly district, was constructed for the benefit of Tanjore alone. About 12 miles west of the town of Trichinopoly, the Cauvery parts into two branches, one of which retains the same name, while the other takes that of the Coleroon. The former flows by Trichinopoly, and irrigates almost the whole of Tanjore, while the latter is of comparatively little use for irrigation. For many years past it had been observed that the bed of the Coleroon was gradually deepening, while that of the other branch was rising, and the effect of this change was increasing difficulty in securing a sufficient quantity of water in the Cauvery for the irrigation of Tanjore.

It was built solely for the benefit of Tanjore;

From the very beginning of our possession of the country the difficulty was felt; and one of our ablest Engineers (Colonel Caldwell) predicted in 1803, that in not many years the Cauvery would be dry and the country ruined. Various expedients were resorted to from time to time to stop this evil, but the benefit from each was only temporary; the supply to Tanjore became more and more scanty and precarious, and it seemed as if the consummation foretold by Colonel Caldwell was near at hand. At this juncture, Captain A. Cotton proposed an anicut across the head of the Coleroon; such a work was accordingly constructed in 1836, and it has most completely effected the end in view. Not only was the downward tendency of the Tanjore revenues at once arrested, but signal improvement has been obtained; the irrigation was not only rendered more abundant, but much less fluctuating, and both the Government revenue of the province and the prosperity of its inhabitants have attained a higher point than ever before.

But did incidentally benefit Trichinopoly.

305. Thus, as already said, the anicut was built solely and exclusively for the benefit of Tanjore, and the cost of it has been recovered there, over and over again; but it did also incidentally benefit parts of Trichinopoly district. The Lalgoody Talook is watered by the Coleroon, and its principal channels being now taken

taken off at the anicut,* received a better supply than before, and a part of the Conaud Talook is watered by the Cauvery below the anicut, and those lands also are consequently better supplied than before. It was to be expected, therefore, that the revenue would improve as it did in Tanjore; but this has not been the case, and we proceed to consider the cause of this disappointment.

Causes why an increase of revenue has not appeared there.

306. Appendix (E E.) shows the revenue from works in the Trichinopoly district, connected with the anicut, for 20 years, as well as the yearly average price of the best sort of paddy in the town of Trichinopoly for 42 years. It will be seen that on the whole there is a considerable decrease in the cultivation and revenue in the later years; there is a small diminution in the extent of cultivation and a larger in the amount of revenue.† This is explained by the Collector to be owing to low prices; it appears, certainly, to be so, and the low prices seem to be owing to the contraction of the market, through peculiar and extraneous causes. On looking, indeed, at the price list, it is not found that any fall of price has taken place, taking the whole period of 42 years included in the statement. On the contrary, not only is the average price of the 5 and 10 years periods maintained, but the lowest annual prices within the last 10 are not so low, with one exception, as the lowest about 30 and 35 years ago. Unfortunately, however, we have not the accounts of the revenue under these channels for more than 21 years back, and we are thus compelled to confine our comparison of prices with cultivation and revenue to this limited period.

The accounts obtained do not go far enough back.

307. Of the 21 years included in the statement the anicut has been in operation 14; and during this time the cultivation and revenue of the lands influenced by it have ranged considerably lower than in the seven years which preceded its construction. Now, if we look to the price list we shall discover an obvious explanation of this; the average price of the best sort of paddy during the seven years, was 101 rupees, 1 anna, a garce, while that of the 14 was 90 rupees 11 annas. We may also observe, that the earlier period includes several years (Fuslies 1242, 1243, 1244), in which there was a dearth in the adjoining dry grain countries, which would naturally give an impulse to cultivation in lands possessing irrigation. Generally, an intimate relation between the extent under cultivation and the range of prices is very observable; modified in some years when, though prices were high, a somewhat scanty or unseasonable supply of water limited the cultivation. This observed sympathy between the price of grain and the extent of cultivation, both directly confirms the Collector's explanation, and also affords ground to suppose, that if we had the means of carrying the comparison over a more extended term, we should not find that decline of revenue which appears on the shorter period.

Effects of the withdrawal of troops from Trichinopoly.

308. The cause which appears to have led to the diminished demand for grain is as follows: Trichinopoly, which is the one great market of the district, contains, with its suburbs, a civil population of 60,000 persons, besides a considerable military force. Till within a few years the garison comprised, besides a detachment of artillery, one regiment of native cavalry, and one of European and three of native infantry; in 1843 one of the infantry regiments was withdrawn, and in 1849 the cavalry was withdrawn also. It is stated by the officer commanding the division, that the united local monthly expenditure of these two corps amounted to *Rs.* 21,000, besides 1,200 for grain. Now it is certain that nearly the whole of the former sum, and no small part of the latter, would be spent directly or indirectly in rice; and there cannot be a doubt that the cessation of this large expenditure would affect the demand for that article, much more seriously than the mere numbers of the troops withdrawn would indicate. For a large

* One of these two channels was already immediately above the site of the anicut; the other had to be prolonged upwards, about 10 miles to that point. The cost of this prolongation was debited to Trichinopoly, but properly it ought to have been charged to Tanjore; for it was strictly a necessary part of the anicut project, though it is true that incidentally this channel, as well as the other, did benefit by the construction of the anicut. This latter is the new Iyen Voykal noticed above, in para. 272.

† This is the case not only under these channels, but on the whole of the river irrigation talooks. The larger decrease in revenue than in cultivation is stated by the Collector to be owing mainly to the abandonment of lands assessed as two crop, and taking instead those assessed as one crop land; we believe that under the rules prevailing in the Trichinopoly district, this single assessed land may be cultivated with two crops without any extra demand.

large part of the civil population are in great part dependent on the military; and the expenditure of the latter being so much diminished, the former also would have less to spend, and many of them probably would find no means of livelihood, and leave the place.*

Grain supplies from Tanjore.

309. The Collector informs us also, that since the road from Tanjore to Trichinopoly has been completed, grain is brought to the latter place from the Western talooks of Tanjore, which are much nearer to it than many parts even of the irrigated talooks of Trichinopoly district itself. And the Trichinopoly Ryots lie under a double disadvantage in competing with those of Tanjore, since, not only the assessment is 25 per cent. lighter in the latter district, but a part even of that light assessment is remitted when the price of grain falls below a certain point, an indulgence unknown to the Trichinopoly settlement. Still the arrivals of grain from this quarter appear to be extremely limited; and we cannot conceive that they have had any perceptible influence on price.

Summary of the facts.

310. The following then appear to be the facts of the case:—

1st. Though there is such a falling off of revenue since the construction of the anicut, in comparison with the years immediately preceding it, yet the latter were years in which cultivation was stimulated by unusually high prices; and there is reason to believe that there has been no falling off in comparison with earlier periods.

2d. Still it does not appear that the irrigation, undoubtedly improved, has yielded increased revenue. And the cause seems to be, a diminished market in consequence of an extraneous circumstance, entirely unconnected with the operation of the works of irrigation; viz., the withdrawal of troops from Trichinopoly.

Grounds for expecting improvement.

311. It is evident that the Ryots are somewhat discouraged by the prevalence of such low prices; but there are some circumstances to justify us in expecting that this state of depression will not be permanent. In the first place, as a good road from Tanjore has brought Tanjore rice to compete with that of the Trichinopoly Ryots in their own market, so improved communications, which ought to be given on every account, will enable them to send their grain with advantage to the eastward and southward, to Salem, Coimbatore and Madura.

2dly. Trichinopoly has always been a favourite residence of pensioners and others having income to spend, for the very reason of its cheapness; and it is now likely to be still more resorted to by such classes.

And 3dly. It is to be hoped that the low state of the grain market will lead to the introduction of some other agricultural product, an innovation which is much required, and which would be very beneficial. Both the Collector and Civil Engineer, and we may add, the Collector of Tanjore, are quite sensible of the expediency, and indeed the necessity of this change, and Captain Lawford in particular has experimentally shown the Ryots that cotton can be grown successfully on their Nunjah land; the Meerasdars themselves are quite alive to the benefits to be obtained to themselves by the change, and are deterred from the cultivation of cotton or sugar, chiefly by the uncertainty of always finding a market for the new product. The change of system would be more rapid among a people more enterprizing and self-relying; but there seems no reason to doubt that it will ultimately be effected even here.

Concluding suggestions.

312. We will conclude this section with a few suggestions; first, with a view to the reduction of excessive inequalities in the land assessment, and, second, as to some

* The effect of this withdrawal of troops may be roughly stated in figures as follows:—Supposing *Rs.* 18,000 a month out of the *Rs.* 22,200 above specified to be spent in grain, this would give *Rs.* 2,16,000 a year; and that would purchase 2,400 garce, at *Rs.* 90. It would take, on an average, fully 3 ½ acres to raise a garce of paddy; and, of the whole crop, not more than half would annually come to market, the remaining half being devoted to the payment in kind of the expenses of cultivation and carriage, village dues, and the consumption of the cultivator's household: thus it would require the cultivation of 5 ¼ acres to bring a garce of paddy to market, and 2,400 garce would represent the cultivation of 12,600 acres of land. In this country, bad roads confine the market for produce within a very narrow circle, and hitherto rice has been almost the only crop raised from irrigated land; and it is no wonder, therefore, that the diminution of the garrison of Trichinopoly should have been followed by a fall of price and a diminished extent of cultivation.

some other means by which the pressure of the land-tax may be indirectly lightened, impediments in the way of general improvements removed, and the revenue benefited.

And first, with reference to the objection to irrigation extension stated in para. 295, based on the supposed present sufficiency of food. No one probably who holds such an opinion will contend that the people are too well fed, or even sufficiently fed; as a very little observation is enough to show that such is not the fact. The objection, then, to the extension of irrigation works, on the plea that the grain market is already fully supplied, amounts simply to this, that grain must be kept up to a monopoly price in order that Government rent may be paid. But the cheap grain of Arracan is now brought into all the ports of the east coast in very large quantities, so as greatly to affect the price in the districts near the coast; so that if this objection is admitted, we shall have the Government withholding improvement from these territories on the one hand, in order that the price of food may be kept up, and (as they think) the revenue be paid, and on the other keeping prices down, by letting in a flood of cheap grain from another more favoured part of their possessions, where the land tax is no more than a fourth of what it is in most parts of this Presidency. It seems impossible, however, that such a course can be persisted in; and if the objection under notice is founded on fact, a remedy must be found. But it would be impossible, and even if practicable, we think it would be inexpedient, in every point of view, to shut out foreign grain, and steps must be taken, therefore, to lighten the pressure of the rent or land-tax in our own provinces. This is the mode in which matters are adjusted in countries where rent* is private property: it is that in which they are actually adjusted very generally by the owners of rent in this country, viz. by Zemindars, Jagheerdars, and extensive Enamdars; and it comes into operation spontaneously in some of our own districts; *i. e.* in parts of Tanjore and parts of Tinnevelly, where the money assessment varies with the price of grain. In the other districts there is no such self-adjusting process.

Real nature of the objection as to the present sufficiency of food.

313. Independently of all reference to foreign competition, and even independently of the state of prices, some circumstances of the existing settlement call for such a revision. The first of these which we will notice is the inequality of the tax in the several districts, one compared with another.

The land tax is unequal in the several districts;

In Tanjore, the supply of water may be said never to fail; the roads are good (by comparison) throughout the district; and the coast is at hand for export by sea: yet here the land rent averages under *Rs.* 4¾ an acre.

In the river Talooks of Trichinopoly, where the irrigation is the same as in Tanjore, the soil perhaps better, where there is no sea-coast, but a populous town, and military station, which has till lately afforded an unfailing market, the assessment averages nearly *Rs.* 6 an acre.

The two southern Talooks of South Arcot district, separated from Tanjore only by the Coleroon River, possess precisely the same soil and the same irrigation, and have also a seaport (Porto Novo); but they want the important advantage of good roads, being almost destitute of any: yet in these Talooks the rent of irrigated land averages above *Rs.* 7¼ an acre.

In North Arcot, the irrigation is much more precarious, being chiefly derived from the local rains or from rivers of second or third rate, less influenced than the first-class rivers by the south-west monsoon; the district is very ill provided with roads, and has no water carriage: here the assessment averages above *Rs.* 7½ an acre.

Lastly, in Cuddapah, the irrigation is about equal to that of North Arcot, being partly derived from the Pennar and other minor rivers, and partly dependent on the local rains; it is much worse off for roads than even North Arcot: and here the assessment of the wet land averages *Rs.* 8¼ an acre.

314. Now, when it is remembered that in all these cases the basis of the settlement was the same, viz., an equal division of the crop of grain between the Ryot and the Government, after certain deductions which do not vary very materially from place to place, it seems impossible to avoid the conclusion that this great diversity

And requires to be equalized.

* Though not professing to constitute the whole "rent," the land assessment, except on the Western coast, is so heavy as to leave scarcely anything as rent, except in Tanjore, Chingleput and parts of some other districts.

diversity of the assessment in different districts is not due entirely to real variation of circumstances, but in great part to diversities in the mode in which the general principles of the settlement were applied by the different Collectors. Whatever the cause, indeed, it is an undeniable fact that the assessment is much more burdensome in some districts than in others; and we think this inequality ought to be removed or materially diminished, not less as a measure of justice than as a necessary step to the improvement of the country: for even where the tax is not so high as to keep the land out of cultivation, it is in most districts so high that it almost or entirely absorbs rent, and leaves but little inducement to the extension of cultivation. Nor do we entertain apprehensions that such reduction of the land assessment, if coupled as it ought to be with the improvement of the works of irrigation and of the roads, would at all reduce the total amount of the land revenue. The people of this country, though not enterprizing, are peaceful, industrious and eminently fond of agriculture; and we think there is no room to doubt that large extension of cultivation would follow any material reduction of the assessment.

And the best lands are waste because too highly taxed.

315. There is another sort of inequality in the assessment, which acts still more injuriously; viz., that in several districts the best soils are so heavily taxed as to be kept permanently out of cultivation, while labour and water are applied to inferior soils more lightly assessed in proportion to their capabilities. This fact has long been known, and the evil of it admitted; but under a system of centralization which requires that before any change every minute detail shall be previously explained to the satisfaction of the controlling Board and of the Government, no progress we believe has yet been made in rectifying it. The remedy required is, to reduce the assessment of such over-taxed lands; and this reduction would not involve loss, even supposing no extension of cultivation to ensue, for high-class land, now waste, would then come into cultivation in place of inferior land; and the exchange would give the Ryot a larger return for the same amount of labour, while the receipts of Government would not be diminished, and perhaps increased.

Some indirect means of lightening the land tax.

316. The following are a few measures, most of them involving little or no cost, which we fully believe would tend, each in its degree, to lighten the burden of the land-tax, and so remove obstacles from the way of improvement.

The scarcity of coin is an evil to the Ryot;

One great difficulty which the Ryot has to encounter in the payment of his rent is the scarcity of coin. We have been unable to procure any definite information as to the amount of coin in circulation; but we have good reason to believe, and we are countenanced in this belief by Major J. T. Smith, the Mint Master, that the whole currency very little exceeds the land revenue; that revenue has rarely amounted to 365 lacs of rupees, and it may safely be assumed, therefore, that the whole currency does not exceed 400 lacs, or four crores; of this amount, no less than about 240 lacs is always lying idle in the various Government Treasuries at the Presidency and in the interior, so that no more than 160 lacs of rupees is left for the payment of the revenue, and for all the private transactions of 22 millions of people. And it must be remembered that in this country paper-money is almost unknown, except at the Presidency; that even private bills are in very limited use; and that large sums are permanently kept in coin by private persons, from the absence of banks or other easy and safe means of investing money. Bearing in mind this hoarding custom, it may be assumed that all the coin circulating in a district has to be paid into the Treasury fully three times over in the course of the year.

And large sums are annually transmitted to the Presidency, only to be carried back again.

317. A part of the coin paid in returns into circulation directly and promptly, in the salaries of public servants, the pay of troops, and the outlay on public works; but large sums are sent every year to the Presidency. The amount annually thus withdrawn from the districts, including sums sent direct from outports to Calcutta or Bombay, considerably exceeds 113 lacs on the average of the last five years. The amount remitted from each district varies from two or three lacs to 50 or even 20, according to the total collections and the local expenditure; these large sums must find their way back into the provinces, for there is no other way of supplying the coin for payment of revenue; but it is difficult to say exactly by what means this transmission is effected, especially in the case of those districts which do not produce articles for the English market; it takes place in great part in the ordinary course of trade, and much of the coin would probably return even if there were no Government kist to be paid; but it is seems clear, that to ensure the punctual presence of the proper quantity of coin, at the proper time and place, to pay

pay the monthly kists in every Talook of the 20 districts, must require on the part of the Shroffs or money dealers, no little trouble and cost, for which they must be remunerated. This charge is in fact borne by the Ryots; it results from the necessity laid on them of paying the rent or land tax in a commodity limited in amount, and consequently at a monopoly price. That the payment of the Government land revenue is rendered difficult by the scarcity of coin, is proved by the results experienced wherever large sums are brought into a district by English merchants, as in the case of sugar works, indigo factories, or the purchase of cotton, or where large sums are retained and expended on public works; in such cases, coin becomes cheaper, the Ryot's produce is easily converted into money, and the revenue is collected without difficulty.

Bills on the up-country treasuries should be more liberally issued at Madras.

318. It is obvious, therefore, that anything tending either to increase the quantity of coin circulating in the provinces, or to save the cost of its transmission from the Presidency, will be a boon to the Ryot. Coin is now brought to the Presidency at the cost of the Government, and carried back again at the cost of the Ryot, ultimately at his cost, though proximately at that of the merchant; both operations might be entirely dispensed with by a more liberal use of Accountant-general's Bills.

These bills are already in use to a certain but limited extent; a great deal of coin is taken back into the interior by people bringing produce to Madras, or is sent up by merchants making purchases in the interior of the country: various contrivances being employed to conceal it, but still with no little amount both of risk and of expense. There is no reason to believe that the amount of coin in any given part of the country varies materially from year to year; and it seems certain that if the Government were to adopt a more liberal system as to Accountant-general's Bills, it would become unnecessary for them to bring specie to Madras. It would only be necessary that such bills should be given to the full amount of the funds available in the up-country treasuries; and that within certain limits they should be given on any treasuries where they might be applied for, even beyond the amount of the surplus collections of those districts respectively, arrangements being made to place funds there from other districts. This may at first appear a startling proposition; but there would be no more cost or risk in proportion to distance and amount in sending coin from one up-country treasury to another, than from the up-country treasuries to the Presidency; and the distance and the amount would both be less. Treasure detachments now come to Madras every year from the inland districts, even from the most distant, such as Cuddapah, Bellary, Coimbatore and Salem; and from other districts it is brought the whole or a part of the way by sea. Under the plan proposed, the whole of these operations would be put an end to; and in their place, a part of the whole sum now conveyed would be carried shorter distances from one district to another. Such an arrangement would be economical as regards the Government, and it would benefit trade; and it cannot be beneath the Government to consult the interests of commerce, the advancement of which is so intimately connected with the increase of the revenue.

Some improvements suggested in the mode of granting such bills.

319. Some improvement might be adopted in the mode of granting bills at the Accountant-general's office:—

1st. The fee now paid should be abolished, for the issue of the bill is itself a gain to the Government, as it saves the transmission of so much treasure: and there is no excuse, therefore, for demanding a fee. The fees go to the Deputy Accountant-general, and as that appointment is shortly to be abolished, it will be a good opportunity to abolish these fees also.*

2d. Bills should be given not arbitrarily, but under established rules as to time and mode of application, &c., to all applicants indifferently, and without any delay.

3d. It might be a good thing to publish in every issue of the Fort Saint George Gazette the amount available in any treasury; and a similar statement

* The amount of Accountant-general's bills on the up-country treasuries, issued annually during the last five years, was *Rs.* 90,80,000; and the amount of specie actually brought to the Presidency from the up-country treasuries, in 1850, was *Rs.* 1,10,01,190, at a charge of *Rs.* 9,929. At this rate, the similar transmission of *Rs.* 90,80,000 would cost *Rs.* 8,170; and thus Government have saved that amount annually during the last five years, by the issue of the Accountant-general's bills. This fact takes away all plea for the levy of a fee on such bills.

ment should be made up daily, and a copy given for insertion in the local newspapers on application.

4th. The money is received at the General Treasury before the bill is granted; the bills ought therefore to be at sight.

5th. Bills should be paid, as far as possible, in any Talooks where the money might be wanted; and with this object similar arrangements between Talook and Talook might be adopted to those already spoken of as between district and district.

6th. Promptitude in paying bills should be enforced on the local subordinate officers; and care should be taken that neither in issuing nor in paying bills any subordinate should have power to create delay or raise obstacles, either of which might become a source of exaction.

The introduction of some other crop than rice.

320. Another most important means, not only of increasing the quantity of coin in circulation, but of creating employment for labour, and directly and indirectly increasing cultivation, will be the more extended introduction of some agricultural product, not a common article of food of the people of this country, and having a fixed and permanent value in the European or other foreign market. Although we hold it to be indubitably true that a cheapening of the supply of food greatly and constantly enlarges the demand for it, leading both to the increase of the population and to the advancement of civilization, yet it is clear that other branches of industry must be in existence, by applying themselves to which that part of the labouring class, whose exertions are not required to raise food for the community, may obtain something to exchange for the food which they themselves require. Now it is notorious, that in this country this market for food is extremely small; and as the want of capital and other circumstances prevent India from becoming a manufacturing country, the true means of developing her resources lies in the production of exportable raw produce,* and this cannot take place without directly and indirectly increasing the land revenue. The growth of such a branch of industry, indeed, in order to be healthy, must be spontaneous; yet in a country where both capital and commercial enterprise are so scanty, the aid of Government may be serviceable, not indeed to take a direct part, and so discourage and paralyse individual exertion, but to remove disabilities, if any, and to spread information.

Cotton and sugar.

321. Among the most important of such branches of industry are the cultivation of sugar, cotton and indigo. It has been fully ascertained that cotton, of such a quality as to compete on equal terms with that of America, can be produced at a paying price in Bellary, Cuddapah, Coimbatore and Tinnevelly; and a considerable export actually takes place from all these districts, both to Liverpool and to China. The cultivation of sugar, too, has made much advance during the last eight or nine years, though it is still extremely limited compared with the capabilities of the country.

Now one or other or both these products could be raised in large quantities, and to great profit, in every district. The sugar cane will thrive well in the rich irrigated lands in every part of this Presidency; and there is scarcely a district in which cotton also could not be grown to much advantage, especially in land possessing the means of receiving an occasional watering in the dry season, which is often found valuable to the crop; but all along the east coast of the Peninsula in particular, there are thousands of square miles of land admirably adapted to the growth of cotton, and bearing a very low assessment, because of little value for other sorts of produce. These lands are sandy in soil, near the sea, and possessing, or capable of being easily made to possess, the means of occasional irrigation.†

The Ryots are well aware of the large profits to be obtained from the cultivation of sugar; but they are not generally acquainted with the mode of culture and preparation, and they want the energy and enterprise necessary to seek the information, and to try a new species of industry. As to cotton, again, they are aware that it would

* It seems highly probable that the rapid increase of cultivation and revenue in Tinnevelly, when the means of irrigation were improved, and the similar immediate results in Rajahmundry, when the anicut came even to a small extent into operation, are due partly to the extensive cultivation of cotton in the former district and of sugar in the latter. This fact obviously affords no argument against the policy of improving and extending irrigation; but it forcibly shows the importance of encouraging the cultivation of exportable produce.

† Dr. Royle's book on the growth of cotton in India contains some interesting details of the operations of Mr. Lees of Manchester, in the culture of cotton on lands of this description.

would be a gain to them to have this crop, especially when the price of grain is low; but they are deterred from entering on the cultivation, partly by the novelty, and partly by the fear of not readily finding buyers for the produce. An intelligent and fair dealing buyer on the spot might constantly command a very large quantity of either cotton or sugar.

Means of aiding this object.

322. What is chiefly wanted then on the part of Government, in connexion with this important object, is the publication of all the information in their possession, or obtainable, as to the capabilities of particular localities, and the formation of good internal communications between the interior and the coast. The European merchants of the Presidency are at present far too little informed of the state of matters in the interior; and good roads, and still more railroads, would dispose them to go and see things for themselves, which they are now little prone to do.

Roads are also essential to the bringing to market of various commodities. The opening of a cart-road from Coimbatore to Ponany on the western coast, so that cotton could be shipped there instead of coming to Madras, reduced the carriage of a bale of 300 pounds to the place of shipment, from six rupees to two; making all the difference in many cases between profit and loss on the export. The soil of Cuddapah is very favourable to the growth of cotton; but the demand is very limited, because the communication with the Presidency, only 160 miles distant, is in so bad a state as to be barely passable for wheel conveyances. There are also a variety of articles of raw produce, such as dye woods, oil seeds, hides and horns, already shipped to some extent, and which might be collected and exported in much larger quantities, whereby a value might be given to commodities now worthless, and a large amount of labour might be employed, were not the state of the roads such as to make it commercially impossible to bring such bulky articles from any considerable distance in the interior. But the improvement of the roads and communications is such an important subject, that we must treat of it at length as a separate topic.

The Moturfah tax.

323. In connexion with the important object of increasing the class of consumers not directly concerned with the growth of food, we cannot but observe, that the Moturfah, or tax on tradespeople and artizans, appears singularly objectionable. In a country where the classes engaged in trade, manufactures and the useful arts are extremely few in number compared with those occupied in agriculture, the disfavour of the former branches of industry is increased by a special impost levied on those employed in them; and, if the tax be thus bad in its general bearing, it is rendered infinitely more so by the incidents of its collection; it amounts in all only to 116,000 *l.* annually; and this trifling sum is collected from no fewer than 9,94,224 individuals, being only $1\frac{1}{6}$ rupee, or 2 *s.* 4 *d.* from each contributor. It is also extremely unequal, whole classes which are exempt in some localities being liable to it in others; some wealthy traders are free, while the poor and wretched contribute; and, universally the rate is heavier on the poor than on the rich.*

Again,

* The following table of the Moturfah collections, in a few of the districts, will exemplify the inequality of the tax in the different districts.

Names of Districts.	Total Population.	Number of Payers of Moturfah.	Total Amount of the Tax.	Amount per Head on the whole Population.	Amount per Head on the Payers.
			Rs.	*Rs. a. p.*	*Rs. a. p.*
Tanjore - -	1,676,086	232,321	43,313	– – 5	– 2 $11\frac{3}{4}$
Bellary - -	1,229,599	145,300	2,72,576	– 3 $6\frac{1}{2}$	1 14 –
Trichinopoly -	709,196	5,834	6,525	– – $1\frac{3}{4}$	1 1 $10\frac{3}{4}$
Kurnool - -	273,190	12,104	55,992	– 3 $3\frac{1}{2}$	4 10 –
Canara - -	1,056,333	28,301	16,567	– – 3	– 9 $4\frac{1}{2}$
Malabar - -	1,514,909	211,152	1,15,742	– 1 $2\frac{1}{2}$	– 8 $9\frac{1}{4}$

Thus the average per head on the whole population varies in these districts from $1\frac{3}{4}$ pice (less than a farthing) in Trichinopoly, to $3\frac{1}{2}$ annas ($5\frac{1}{4}$ *d.*) in Bellary; the rate per head on the payers varies from 3 annas ($4\frac{1}{2}$ *d.*) in Tanjore, to *Rs.* 4. 10. (9 *s.* 4 *d.*) in Kurnool. The land assessment is very much more burdensome in Kurnool than in Tanjore. Madura, which does not differ from other districts, except in having a land assessment lighter than most, is altogether free from the Moturfah tax.

A large part of the Moturfah is paid by the weavers, and forms an addition to the difficulties with which they have to contend in competing with the English manufacturer. In this case, too, the tax is more than usually inquisitorial, as the amount varies with the number of looms employed by each payer; houses are frequently entered in order to discover concealed looms, as the Indian loom is easily dismantled and put away.

Again, except in the Ceded Districts, where there is some attempt at system, the tax on each individual is determined in a manner wholly arbitrary, and on the information of very poorly paid subordinate officials: each man's tax is of course liable to be raised or lowered as his circumstances vary; and on the one hand intrigue and bribery are employed to obtain a reduction or prevent an increase, and on the other threats of raising the demand, are made the means of extortion; and thus, in various ways, waste of time, intrigue and corruption are occasioned by this tax. In all the other Presidencies it has been abolished; and it is earnestly to be desired that it should be put an end to here also. There seems no room to doubt that the small amount of revenue sacrificed would speedily be replaced by increase in the land revenue, as has been the result in the case of the transit duties.

Section VII.

General View of the present Condition of the Roads of this Presidency; with Remarks on the urgent necessity for their real and effective Improvement; and with some Observations on the Harbours, and their need of attention.

A detailed review is necessary.

324. In a former Section we detailed the treatment of the roads of the Madras Presidency up to the year 1846, and traced the operations of the Road Department on the few lines placed under its charge, up to the month of May 1851. We will now endeavour to show what has been done with regard to the roads of the country generally in the intervening period, and what is their condition at present: unless this be done so as clearly to exhibit the actual condition of the communications, our suggestions regarding their future treatment will scarcely meet with due attention. If we state in general terms that the means of communication are very bad, and the cost of carriage very high in consequence, it may be admitted that some change is necessary, and that an effort must be made to put the Madras Presidency more on a footing with the rest of the civilized world in this all important particular, and we have no fear that the roads hereafter will be as much neglected as they have hitherto been; but if through failure to give sufficient individual detail, we leave the impression that some slight modification of the present system, with a moderate increase of expenditure, will do all that is required, our report will confirm rather than correct, the existing evil.

Sources of information as to the state of the roads.

325. When it was determined that a few of the main lines were to be placed under a separate Road Department, a most judicious order was issued by the Most noble the Governor in Council, that Collectors "should submit, with their annual reports on the extra sources of revenue of their respective districts, a separate report on the roads and communications; and point out distinctly the actual advantages to the Foreign and to the Home trade of the country arising from the improved means of transport." They were also called upon "to make such suggestions for the formation of new lines, and for the extension generally of the means of communication throughout their districts, as may appear to them to involve important results." And, in like manner, the Civil Engineers were directed at the same time to report annually on the roads in their divisions, after an examination of their condition.

The former of these orders has been acted upon with tolerable regularity, but the latter has not been enforced. The Board of Revenue (letter 7th May 1846) represented to Government that it would "be impracticable for the Civil Engineers to carry into effect the instructions of Government on this subject, and at the same time to attend to their other important duties. The divisions," the Board observe, "are severally of such great extent, and the more important works under execution at different points require such frequent visitation, that the officers in charge are rarely able to undertake any lengthened course of inspection of particular parts, but are obliged to be in constant readiness to move rapidly over great distances whenever calls are made for their services. Under these circumstances there would be no probability of their being able even to see all the branch roads of their respective divisions in any year; much less could they carefully inspect them, so as to be enabled to prepare a useful report upon their actual state. The Board are indeed persuaded, that it is in vain to expect from the Civil Engineers the invariable performance of any routine duties, considering how much more important it is that these officers should be available upon all occasions where superior professional knowledge is required. It is certainly highly desirable that the ordinary

duties

duties of divisions should receive regular attention, and that the annual inspection of the roads should be included in these duties; but there are not enough officers, both for these and for the more important demands of the state, for Engineer's service, and it does not therefore appear expedient to assign to the present Civil Engineers additional labours of annual recurrence, which it is not possible for them to perform."

Before March 1847, however, a report had been received from each of the Civil Engineers, and a general summary of their contents was prepared by the Board of Revenue, and forwarded to Government on the 15th of that month. From this paper, the annual reports of Collectors, and the answers received by the Commission from the Civil Engineers, regarding the state of the roads in their respective divisions, we are able to give a tolerably accurate account of the operations on the communications of the country during the last six years, and of their condition at the present time.

The surplus pagoda funds.

326. This seems a convenient place to mention another important measure in connexion with the improvement of the roads, which also was adopted in 1846; we refer to the allotment of a large part of the accumulated surplus pagoda funds to such improvements. While the Hindoo Temples were under the official management of the Collectors, a large surplus accrued in some districts, in consequence of the income from the endowments being much in excess of the expenditure; and when it was determined to dissever the connexion of Government with the Temples, this surplus considerably exceeded 12 lacs of rupees. Of this amount it was resolved to set apart eight lacs (80,000 *l.*), for the purposes of general education; and we may observe that this fund has remained unemployed to the present time. The remainder was given up for local improvements, one lac of the amount being expressly devoted to the formation of a road to connect the cotton districts of Tinnevelly with the port of Tutecorin.

The following statement shows the distribution of the expenditure of the surplus pagoda funds:—

	Rs.	*a.*	*p.*		*Rs.*	*a.*	*p.*
Vizagapatam	713	15	4	Madura	20,000	–	–
Masulipatam	209	13	1	Tinnevelly	10,000	–	–
Guntoor	7,937	6	2	Chingleput	40,234	–	–
Nellore	4,310	1	9	Trichinopoly	40,234	–	–
Madras	3,420	8	–	Coimbatore	38,835	6	7
Cuddapah	4,919	3	10	Bellary	12,872	7	2
Salem	39,004	11	4	South Arcot	26,687	3	11
Canara	7,124	12	10				
Tanjore	80,000	–	–	Total *Rs.*	4,26,584	10	–

Extent of made road in 1846.

327. In the Board's report of March 1847, a statement is given of the "made roads," which, however, includes certain spaces where the natural surface was so favourable, that no disbursement was considered necessary for the formation of a road. The roads mentioned in the list being in fact only such as were considered worthy of repair.

Extent of made roads (or roads naturally practicable for carts) in 1846:—

	No. of Miles.		No. of Miles.
1 Ganjam	40	15 Salem	400
2 Vizagapatam	0	16 Coimbatore Neilgherry Ghauts	49½
3 Rajahmundry	8½	Low Country	482
4 Masulipatam	2	17 Canara	80
5 Guntoor	39	18 Malabar, Neilgherry Ghauts	63½
6 Nellore	15	Low Country	70
7 Bellary	9	19 Madura	682½
8 Cuddapah	3½	20 Tinnevelly	293½
9 Kurnool	0		2,880¼
10 North Arcot	36¼	Made roads under the Road Department, about	230
11 Chingleput	11¾		
12 South Arcot	9¾	Total	3,110¼
13 Tanjore	533¾		
14 Trichinopoly	50¾		

328. Although

The real condition of the so called "made roads."

328. Although 3,110 miles of road, extending over the 138,249 square miles which constitute the area of the Madras Presidency, would be totally inadequate to its wants, it might be inferred from the foregoing statement, that with that length actually under management, an extension of the system might be gradually proceeded with, till the means of communication were complete. To guard against such an idea, we must explain that nearly the whole of the made roads (so called) are only so far made as to be just practicable for carts. Even when in what is called "good" or "fair" order, they are only in such condition as to be classed, where indeed we find them, with those lines through a favourable country, where "no disbursement for the formation of a road is required." They admit of carts moving in dry weather, with light loads, at a very slow rate, and by very short stages. But by far the greater portion of these roads are unbridged, and a heavy shower cuts off the communication wherever a stream crosses the line, and they are, in many cases, so unfit to stand the effect of wheels while the surface is wet, that in the monsoon months they are out of use except for cattle or foot passengers. The draft on such roads is far greater than on the most ordinary roads and lanes in England; and we need not observe how great a decrease in the expense of transport is effected there, when such ordinary roads or lanes are brought by bridges and a surface of metal, into the condition of the turnpike-roads, a condition in which we have scarcely a mile of road in the whole Peninsula. This will be seen clearly by the annual reports already mentioned, which we now proceed to review, commencing with the most northern district, Ganjam.

State of the roads in Ganjam district.

329. The first report upon the roads of Ganjam was sent in by Mr. Bannerman, in October 1848. He says, "With the exception of what is called the Northern Trunk Road, upon which a considerable sum has been frittered away in the last six or eight years, there is not a single yard of made road in the Ganjam District; the lines of communication from village to village remaining in their original primitive state." He mentions one Pass on the Northern Road (the Kerdamooloo Ghaut), as being of use in facilitating the communication with Cuttack; but the line of road not being completed to any of the large towns, little or no effect on the trade of the country seems to have been produced by it. In 1849 no report was sent in. In 1850, Mr. Onslow quotes Mr. Bannerman's report of 1848, and says that nothing has been done since that time; and in 1851, the same gentleman states that no progress has been made, except in the trimming of an avenue, which he considers objectionable. The Assistant Civil Engineer, in answer to the questions regarding the roads of the district in his subdivision, corroborates these accounts.

Both Mr. Bannerman and Mr. Onslow speak of the necessity for roads in Ganjam; the latter remarking especially upon the importance of opening such as would lead from the interior to the coast; which lines, he very justly observes, are more needed than the only line (the Northern Trunk Road, parallel to the coast) which has, as yet, had any attention paid to it.

The importance of roads to save military operations;

330. Mr. Onslow also adverts to an important use of such lines: he says, "If the products of Purlah Kimidy could have been transported to the coast with facility, and if troops could have been passed into it along good roads years ago, much treasure and many lives might have been spared." He alludes to the Khoond country, which, when in a disturbed state a few years ago, led to such severe loss both of men and money. And there can hardly be a doubt that if the same enlightened policy which induced Lord Elphinstone to open a first-rate road through the rebellious Talooks of Canara, had been extended to that country, after the conclusion of the first disturbances, there would have been no necessity for taking a force into the field a second time.

The expenditure by Lord Elphinstone's Government on the Sumpajee Ghaut, was considered large, and so it was, compared with the sums spent on roads in general under this Presidency; but it was a trifle in comparison with the cost of an army in the field, even if every movement were successful. And if such a course of policy was wise in that part of the country, where the climate is not such as to interfere with the operations of our forces, how much more urgent was the necessity for such improved means of communication in this fever infested district, where every night spent by an army in its progress to the scene of action, entails so much certain loss of life.

And to civilize barbarous tribes.

331. Even in a military point of view, the effect of roads opened from the sea coast

coast into the wild country of the Khoonds would be a measure of true economy; but the benefit derived from them would be greater still, in giving an outlet for the produce of the land, by bringing that peculiar people into more intimate communication with their neighbours, and affording them the means of learning the inutility as well as barbarity of their human sacrifices. It has been the opinion of those engaged in the suppression of these dreadful rites, that if the country were thrown open by roads leading to the coast, as well as to the territories of Nagpore upon the eastern frontier, prosperity and better intelligence would do more to correct the ancient superstition than force or persuasion can be expected to effect in any length of time. Mr. Russell, Special Commissioner to the Northern Circars in 1837, writes as follows: Report, dated May 1837, para 70: "I have already remarked, in another place, that the prejudices of caste have little influence among them (the Hill tribes); there is therefore less drawback to a free intercourse with them than with any other people on this side of India, and there seems every reason to hope that this peculiarity in their national character, and their taste for foreign productions, by leading to more frequent and unreserved communication with the officers of Government, and the inhabitants of the Low Country, and thus extending their knowledge, will gradually wean them from this barbarous superstition, more especially, as even among their own caste, the rite, though very general, is not an universal practice; it has no existence in Degee, Goodoodaye, Baree, the Maliahs of Bodayhodo, Coradu or Sooradah. It is true that this is a very confined tract, compared with the great extent of territory wherein it prevails, but the exception, small as it is, is a fortunate circumstance, and seems to offer a better groundwork for our exertions, than remonstrances, to be enforced by the sword."

Mr. G. E. Russell's opinion.

332. "The importance of direct communication with the interior, in a commercial point of view, may seem too obvious to need comment. As a single proof, we give an extract from the Jammabundy Report of the Principal Assistant to the Collector of Ganjam, 1st November 1850. A gentleman lately mentioned to me that he had agreed for a large quantity of gingelly oil seed, to meet the demand which has sprung up in France, where the seed is made into olive oil; but the parties declined the contract, when they found it (*i. e.* the seed) was to be delivered in December, as they declared the roads were impassable, and the seed has been purchased elsewhere. I would, therefore, beg leave to urge the necessity of the immediate formation of a good road leading to this port (Calingapatam) lest the trade, from which so much good is to be expected, should be diverted into other channels."

The want of a road to the port of Calingapatam.

The Commissioner, Mr. Walter Elliott, in his proceedings on that report, dated 9th October 1851, states, that the road from Calingapatam to Chicacole, the largest town in the district "(only 12 or 14 miles distant) passes through a swamp about four miles broad, which is impassable for carts or beasts of burden for several months of the year, and is traversed with difficulty by unencumbered travellers, although it forms a part of the old line of the Great North Road, to within a mile of the port."

333. Lieutenant Rundall, the First Assistant Civil Engineer, has lately made an estimate for a new road from Berhampoor, through Aska to Russelcondah, to the amount of *Rs.* 1,42,246 for 45 miles. The road would form part of a main line between the coast and Nagpore. It would pass through the most fertile part of the Ganjam district; would give the extensive sugar works established by Messrs. Binny & Co. at Aska, an uninterrupted communication with the shipping port, and would enable troops at any season to move rapidly on Goomsoor. If extended to the westward it would supply the long required passage through the country of the Khoonds, open a most extensive market in the Nagpore country for our salt, give a direct road from the sea to the capital of that territory, and would raise a traffic between the interior and the coast, to the benefit of a vast population both within and beyond the Company's frontier.

Road from Russelcondah and Aska to the coast.

The value of a free communication in this direction would be incalculable; and in forwarding the estimate both the Collector and the Engineer wrote most strongly to recommend it. The Government, however, considered that so expensive a road was not necessary, and ordered the estimate to be amended for a second class road; and this term signifies a road without bridges or a surface of metal, which, in the locality in question, where there is a long season of rain, would be out of use four or five months of the year.

While writing on the roads of Ganjam we had the advantage of a conversation with Mr. Boothby, then just arrived from Aska, where he has the management of the sugar manufactory above alluded to. This gentleman pointed out forcibly the advantage that would be derived, not only to the undertaking in which he is engaged, but to the country generally, by this road being opened and rendered efficient through the year. We have since received from Messrs. Binny & Co. a letter addressed to them by Mr. Boothby on the same subject, which so clearly illustrates the stagnation resulting from the want of roads in the country, that we have thought it advisable to print it with this Report (Appendix P.), and we would call attention to it as containing matter of the deepest importance. We find from it, that when in full operation the manufactory at Aska will annually spend a sum equal to half the revenue of the district. The effect on the prosperity of that collectorate from the circulation of so much capital, can only fully be realized by those who know the universal want of employment for labour and of a market for produce. It will be seen that Mr. Boothby's operations would not be limited to sugar, if other and more bulky commodities could be transported to the coast at a moderate cost.

The roads of Vizagapatam district.

334. Mr. Smollett, the Collector, in his report of 1847, says, "Throughout Vizagapatam there is nothing which deserves the name of a road; that is to say, that except in cantonments there is no road or highway from one station to another, along which a carriage or gig could be driven for a mile." In 1849 the report states that nothing has been done, and in 1850 there is still no change. In 1851 the Collector states, that a road from Vizianagarum to Bimlipatam has been commenced; and the First Assistant Civil Engineer says, "With the exception of a road lately made by His Highness the Rajah of Vizianagarum," (viz. that just spoken of to Bimlipatam) "there are no district roads throughout the subdivision." The subdivision alluded to comprises the two Collectorates of Ganjam and Vizagapatam, having an area of about 14,000 square miles. Here again, we find a whole Collectorate without any tolerable approach to either of its shipping ports, or any single road practicable for carts leading into the interior. And this district (Vizagapatam) has a coast line above 100 miles in length, and contains above 7,650 square miles. It materially exceeds in extent the united counties of Northumberland and Durham, with the North and East Ridings of Yorkshire. That populous and busy tract resembles it in position, and would resemble it also in condition, if its ports and its admirable internal communications were totally destroyed, and it were separated from the rest of England by a mountain barrier.

The roads of Rajahmundry.

335. Mr. Prendergast, the Collector, reported upon the roads in Rajahmundry in 1846, 47, 48 and 49; the terms used are nearly the same in all. In his first report he says, that the only good made road in the whole district, is a small portion of the north road in the vicinity of Rajahnuggur, where, for a distance of 10 miles, the convicts have gravelled the line. With the exception of this one stage, the north road is described as "in a wretched state, in some parts sandy, in others passing over black soil, crossed by bridgeless nullahs, and some parts so deep as to be almost impassable after a heavy shower." Irrigation channels are recklessly cut across the line, rendering it dangerous at night. This is the "Northern Trunk Road." The most hopeless account is given of the cross roads; and there were no approaches to even the principal seaports. In the succeeding reports some trifling improvements are mentioned; but they are so absurdly out of proportion to the wants of the district, that they only show in a more glaring light the utter inefficiency of the present system.

Sanction for improvement refused.

336. In one case (the road from Samulcottah to Cocanada) where Mr. Prendergast had pointed out the urgent necessity for a road, and the Civil Engineer's Department had prepared an estimate for it to the amount of *Rs.* 9,796, the Government withheld its sanction for two reasons (extract Minutes of Consultation, 30th March 1849). One was "The absolute necessity for limiting expenditure, especially in Rajahmundry, with advertence to the works of the Godavery anicut;" the other, disapproval of Captain Orr's attention being occupied by any other duty than the anicut. The road was earnestly petitioned for by all the most wealthy and influential native merchants and others in the neighbouring towns of Cocanada, Samulcottah, Peddapoor, &c.; and their representations of its necessity were fully avouched by the Collector and the Civil Engineer. It was only eight miles long, and was to cost less than 1,000 *l.*, and it would have completed the connexion

connexion between the grain growing parts of the Delta of the Godavery and the shipping port; and at that time there was nothing in the shape of a road "on the line;" it lay "across swamps and nullahs, and could not be used even by common bullock bandies, except at the driest season of the year:" the grain for exportation was all brought to the port on pack-bullocks, and the road was "often impassable, even for them, for weeks together;" yet this road was refused. Towards the end of the same year the Civil Engineer, the Collector, and the Board of Revenue, again brought the subject before the Government, praying that at least sanction might be given for the earth-work, leaving the bridges to be constructed afterwards; but even this request was rejected. The Government simply quoted their previous order, and intimated to the Board "that no expense of this nature will be sanctioned in Rajahmundry, until the works of the Godavery anicut are completed." The large expenditure in progress on the works of the Godavery anicut was much more than replaced, year by year, in increase of revenue; yet it was thus made the plea for withholding improvement of the roads. Such a policy was both short-sighted and inconsistent; for all increased facilities for the production of food must greatly depend for their success on the means of carrying the produce to market; to refuse to improve the roads, therefore, is powerfully to check the benefit to be obtained from the outlay on irrigation works. The more irrigation is improved the more are good roads required: and, as clearly seen in the case of Rajahmundry, the larger are the funds available for the work.

In that portion of the Rajahmundry district, which will be under the influence of the Godavery irrigation, there will ere long be a most valuable system of water communication; and already much use is made of the embankments of the new channels, as roads, though they are not in their present state practicable for wheels; but this will do but little towards facilitating traffic between the centre of the continent and the coast, and will benefit only a portion of the Collectorate.

The roads of Masulipatam.

337. Mr. Porter's first report, dated December 1847, shows that there was no tolerable road in the whole of the district of Masulipatam. He designates two "main lines" with reference to the necessities of the country. To one of them, viz., that from Bezwarrah towards Rajahmundry, 73 miles in length, which forms a part of the Northern Trunk Road, he calls special attention, and cites several passages in the diaries of the Civil Engineers during the previous 10 years, in which "the lamentable state of this line" has been brought to the notice of the Board. The other road is from Masulipatam towards Hyderabad. Of this most important Military and Commercial line, leading from the Port and Arsenal of Masulipatam towards the capital of the Nizam's dominions, he says, "it may with truth be said to be in many parts impassable in the rains, and not to be traversed without difficulty and danger in the dry weather."

He calls attention, also, to one other line, from Masulipatam to Ellore; the former a populous town and seaport, and the latter a large manufacturing and commercial town, containing 30,000 inhabitants, and the great entrepôt of trade in that part of the country, between the coast and the interior. He states, that the distance between these two places in a direct line is under 50 miles; but, in consequence of the badness of the road, and the want of means for crossing the watercourses which intersect it, it is frequently necessary to make one of two circuits; which increase the distance, in one case to 67, and in the other to 87 miles; and even those circuitous routes are only just passable.

Testimony of the Civil Engineer.

338. In the same gentleman's subsequent reports in 1848, 1849, 1850, and 1851, he urges the necessity for something being done, and records a few such improvements as the following: the prickly pear bush, which covered the road between Masulipatam and Nedomole, and from thence partially towards Weyoor, has been removed at an expense of *Rs.* 275. 2. 2., which has been defrayed from the sum of *Rs.* 400, allowed annually for the whole district. Mr. Porter continued to urge improvement, but as yet nothing has been done. That he had not given an exaggerated account of the wants of his district, will be seen by the following extract from the reply of the Civil Engineer of the 1st Division, to our query on the subject; his remarks have reference to his whole division, comprising (without the sub-division, which is a separate charge), the three Collectorates of Guntoor, Masulipatam and Rajahmundry: "There is a very small extent of road in this division that is in a practicable state in the monsoon; a very large part of the Great Northern Road is quite impassable in wet weather, most of it neither metalled, nor bridged, nor drained; and in the Delta the roads are in the same state;

state; indeed they are not in general even marked out for bandies, so that there is scarcely any bandy traffic even in the dry season; twice I have been able to average only a mile an hour in a palanquin; on the great Northern Road I have known a gentleman take four hours to travel seven miles on horseback. The superintendent of roads has applied to me several times about the roads, but I have not been able to do anything that he required."

In this district no mention is made of cross-roads, or of any passes into the interior, except the one leading to Hyderabad, which is so ill reported of. Like the three districts already spoken of, it has no tolerable communications with the country inland, or even the means of conveying its own produce to the coast, though so close.

The roads of Guntoor.

339. In Mr. Stoke's report for 1846, on the roads of Guntoor, he names four principal roads, one a part of the same Northern Trunk Road already so often mentioned, from Madras towards Calcutta, one from Madras towards Hyderabad, a branch of that last-named, one from Guntoor inland to Cuddapah, &c., and the fourth, a line parallel to the coast. "Of these," he says, "only one has been regularly made, and while in good order the advantages were very great, but in its present state, from the month of June till October, bandies can only pass with very great difficulty, if at all." Of the second, he states that it was improved when Mr. Whish was Collector "(about 20 years ago), since which little or nothing has been done to it." In parts it was still pretty good, but in others almost impassable. The third road, running directly inland, is of the greatest importance to the trade of the district, and although "it appears never to have been repaired, running over a tolerably hard soil, bandies pass without difficulty." The fourth is a sandy track, which has had an avenue planted along it, but has received no other outlay.

In 1848, the Collector expresses a hope that something will be done for the main roads. In 1849, the Superintendent of Roads passed through the district, and inspected the Northern Road, as well as that towards Hyderabad; estimates were supposed to have been prepared, and hopes were again expressed regarding the other lines. In 1849, four small bridges were built, and one mile of road made. The Superintendent calls for data, which raises new hopes, and the Assistant Civil Engineer prepares estimates for the repair of two very bad pieces of road, but these were "not sanctioned," and the orders of Government (18th November 1848), prohibiting all but necessary disbursements, were thought unfavourable to further recommendations.

In 1850, Mr. Newill, the Acting Collector, writes as follows: "The state above described, of the two main roads, continuing as it has for the last eight or nine years, and the defects of the two other roads to Masulipatam, cannot but have a very bad effect upon the trade of this district with other parts of the country, being sufficient to damp what little enterprise may exist in its commercial transactions." This gentleman sees the importance of cross roads in the district, and speaks of the laying of them out as an "important preliminary to the survey."

The road of Nellore.

340. Mr. Smith reports, in 1847, that the Northern Trunk Road through the Nellore district has had repairs to the value of *Rs.* 3,051, and that an Overseer has been appointed to manage it; and the Superintendent having seen it at its worst, he hopes it may be satisfactorily repaired. In the south east side of the district he was able to carry his tents and records on carts. The only other lines mentioned are, that leading inland to Cuddapah and the Ongole and Hyderabad road, but the condition of these is not specified.

In 1848, considerable improvement of the Northern Trunk Road is reported south of Nellore, but north of that station, nothing had been done; and the only improvements of the other roads are enumerated in the following items:—

	R.	*a.*	*p.*
Roads and Bridges about Nellore - - - -	48	11	8
Ditto - - ditto about Ramaipatam - - -	50	–	–
Raising a Parapet-wall on a Bridge over the Daroor Channel - - - - - - - -	23	10	–
Opening a Road to Kistnapatam - - - -	304	–	–

In this report the Collector again mentions that he has used carts on his tour, that mode of conveyance being apparently a novelty.

In 1849 between *Rs.* 7,000 and *Rs.* 8,000 was spent on the North Road south of Nellore, but nothing north of that station, or on the other lines in the district under

under the management of the Road Department. The expenditure on the cross roads consisted of six trifling items, varying in amount from *Rs.* 196. 15. 5. to *Rs.* 12. 6.

In 1850, the Superintendent of Roads traced a new line between Nellore and Ongole, and an estimate amounting to *Rs.* 6,156 was sanctioned for the improvement of the important line into the Cuddapah district.

The Northern Trunk Road.

341. In 1851, the Northern Trunk Road south of Nellore is reported by Mr. White to be in a fair state. North of that station it has still further deteriorated; and on the Cuddapah road, the repairs sanctioned have not advanced sufficiently "to admit of its usefulness being reported upon." Thus in this district of 8,000 square miles, there is, up to 1851, only one short piece of road in good order; viz., a part of the Northern line from the Southern boundary of the district to Ulloor, a few miles north of Nellore. Of this road the Civil Engineer of the Division writes as follows: "The only made road in the Nellore district is the high Northern road, the southern portion of which, from Arumbunk to Ulloor, a distance of about 88 miles, has had, from its first formation in 1833 to the present time, several lacs of rupees expended upon it. It is now under the charge of the Superintendent of Roads, and that part from Arumbauk to Ulloor is in better order now than it ever was. But that to the north of Ulloor has had nothing done to it during the last 10 years, and is in very bad state of repair. From Ulloor, northward, to the boundary of the district, with the exception of a few bridges near Ramiapatam, Ongole and Singarrycondah, it has never had anything done to it. From Singarrycondah, northward, it runs through black cotton soil, and is almost impassable in the wet weather." He goes on to speak of the line to Cuddapah: "The only other road in this district is that from Nellore to Cuddapah; nothing has ever been done to this road until the present year, with the exception of a few bridges erected in 1834. This season a sum of *Rs.* 10,769. 15. is being expended on it, agreeably to estimates sanctioned by Government." When these repairs are completed this most important road will be but an "improved track," such as would not bear the name of a made road in any other country.

The Nellore and Cuddapah road.

The roads of Cuddapah.

342. Mr. Cochrane, in 1847, wrote as follows of the Cuddapah road: "As with the exception of a small portion of the road leading to Cumbum in the subdivision (the formation of which has lately been undertaken on an estimate of *Rs.* 1,867. 8. 0.), there is not a made road of any description throughout the whole length and breadth of this extensive province, in which so much trade and commerce are carried on, particularly in cotton, sugar and indigo; and as the great difficulty of transport, occasioned by the total absence of good roads, must necessarily, in a great measure, consume, in the mere cost of transit, the value of the goods at the port of export, it is most probable that no district in the Presidency is in greater need of improved means of transport being afforded for its produce for exportation." Mr. Cochrane points out the most important lines that he would have improved, and gives the best reasons why some such means should be adopted for reducing the cost of carriage.

In 1848, he suggests that as the roads were "in the worst possible state," and as Government had shown no disposition to do anything to improve them, and "as the want of facility of transit is so severely felt as to render the adoption of remedial measures indispensably necessary;" that, therefore, if Government was not prepared to meet the exigency, funds should be raised for the purpose by a local tax, and he proposes a scheme by which he estimates that a sum of *Rs.* 54,662 might be levied annually from the payers of land revenue and of the Moturfah, and from the holders of Enam land.

In 1849, he reports the improvement of the Goolcherroo Pass as in progress, to open a direct communication between Cuddapah and the Carnatic. In 1851, Mr. Murray (Acting Collector) reports that work as still in progress, and gives the same lamentable account of the roads in general, complaining that there is still no direct road even to Madras, and he might have added to any other seaport.

Mr. Forbes's Report.

343. In November of the same year, Mr. Forbes, the new Collector, writes, "The Board are well aware that, with the exception of the work on the Goolcherroo Ghaut, nothing whatever has been done to improve the communications in the past year, and they will, therefore, be prepared for my stating that roads, properly so called, can hardly be said to exist; and that in Cuddapah the communications have not to be repaired, but made."

The Goolcherroo Ghaut has been "completed, and nothing can possibly be better than the execution of the work; but until it can be approached on either side with somewhat less difficulty than at present, its value to the merchants must, of necessity, be comparatively small. It is, doubtless, something gained to be able to ascend the ghaut with safety and ease; but the distance from Cuddapah to Chittoor is 106 miles, and so long as the road is good for only $18\frac{1}{2}$ miles, and the remaining $87\frac{1}{2}$ miles remain such as to make the overturn and fracture of carts a common occurrence, it cannot be expected that traffic on the line will very greatly increase."

"My Cutcherry has been for some days at Koilgoontah, and it is only necessary that I should join it, for the settlement to commence at once. There is nothing whatever to detain me in Cuddapah, but the impossibility of moving my tents after some very heavy rain which has lately fallen; and if this be the case with all the means and appliances at the Collector's disposal, the Board may conclude what is the obstruction offered by the state of the roads to the ordinary traffic of the country."

The Engineer's Report.

344. The First Assistant Civil Engineer, in his report on the roads of this district, says, "The state of the roads in the Cuddapah district is execrable. The most important line from Bellary passing through the town of Cuddapah to Madras (which is the Tappal road from Bombay to Madras), is allowed by all travellers to be the very worst in the Presidency. Within the last 10 years it has been surveyed and reported on by a head Maistry, by Captains Buckle and Lawford; and again, in 1849, by Captain De Butts and myself: but nothing has been done to improve it, although large quantities of cotton, indigo and other valuable products of this and the Bellary district are sent yearly by this road to Madras. When treasure parties are sent by this road to the Presidency, 10 per cent. of the bandies break down daily. The road from Cuddapah to Nellore is nearly as bad; that leading from Cuddapah to Cumbum and the Northern Circars is the best in the district, small sums being yearly expended in improving the worst portions of it. The road from Roychoty to Bangalore, and from Roychoty by Peelair to Arcot are mere tracks; but lately Government has sanctioned the construction of a carriage-road through the Goolcherroo Pass, between Cuddapah and Roychoty. It is, however, impossible for an Engineer to give a proper share of attention to the roads in this district, in addition to the usual Maramut works." And again, "in the Cuddapah district, nothing has ever been done to the roads beyond marking out the Madras and Cuddapah line by an avenue of trees, which was done when Sir Thomas Munro was Collector (about 50 years ago), the Goolcherroo Pass opened and improved last year, and still further improved this year."

Size and importance of the district.

It only remains for us to point out the facts, that the district of which we are treating, the largest but one in the Madras Presidency, contains 13,000 square miles, being nearly twice the size of the whole of Wales, and with a population larger by nearly one-half; that it is at a distance from the sea, with no navigable stream or other natural facility for transport, and that its products are of the most valuable description. It is famous for its cotton, sugar and indigo, commodities which form no slight portion of the exports of Madras, in spite of the heavy expense of carriage they are subjected to, and the deterioration they frequently suffer in the journey. It is quite impossible to overrate the benefits which would result from opening good and direct roads from all parts of this fine district to the port of Madras.

The roads of Bellary.

345. Mr. Mellor's report upon the roads of the Bellary district, in 1847, points out the neglected state of the communications in the most forcible way. He reminds the Board that that large district of above 1,300 square miles has only had, on an average, *Rs.* 1,580 a year spent upon the whole of its roads during the previous 20 years. Two sums, amounting together to *Rs.* 13,202, he states, are the only considerable expenditures that have been made during the eight years of his holding the Collectorate. He specifies the roads he would have first restored, and refers the Board to a former communication, 2d October 1846, wherein, while writing upon the Ryotwar system, he urged the advisability of improving the means of transit through the district.

Mr. Pelly's Reports.

346. In 1849, Mr. Pelly, the Acting Collector, calls attention to Mr. Mellor's Report, just quoted, as pointing out the wretched state of the roads, and brings forward a suggestion for the formation of 700 miles of the principal lines of road in the

the district. In doing this, he refers to the excellent roads made in the adjoining country of Mysore since it came under administration by British officers, from the advantage of which his district is cut off by the bad state of its own roads. He says, "The Board are, doubtless, aware, that excellent roads have been made in many directions throughout the Mysore country, which borders for a distance of about 200 miles along the southern boundary of Bellary. These roads open communication through the territories of Mysore, to Madras, Southern India, and the Western Coast; feasible not only for common carts but for spring carriages. The Mysore roads have been brought up to the borders of the Bellary district (or within a few miles), and connect the two at four different points; but there are no corresponding roads to meet them in Bellary, and consequently not only the large and centrical town of Bellary, but the whole district is cut off from the advantages offered by an open and easy communication with the Mysore territories, the ports on the western coast, and the whole Southern Peninsula."

Mr. Pelly begs that the sum of *Rs.* 50,000 a year may be allowed him for the repair of roads, with an officer who understands the work, to lay out the lines. He did not expect, at first, to be able to spend more; but with such a sum at his disposal, he might organize a Road Department, and have, in a few years, experienced men to work with. His proposal is only to improve the road-ways, apparently leaving the bridging of the rivers as beyond his hopes. He says, "I have not mentioned bridges as forming any part of my plan: we have no arched bridges out of the town of Bellary but one; a few flat stone bridges are all that we can boast of."

In November 1850, Mr. Pelly says, in the annual report, "I have nothing further to add to my report, dated 22d October 1849, the orders of Government on which I am still expecting." He refers to some repairs on a small part of the Bellary and Dharwar road, on an estimate to the amount of *Rs.* 6,177. 13. 0. as on the point of completion; and notices that the further estimate (for *Rs.* 25,200) for this road had not yet received the sanction of Government. He closes his short and hopeless report, with a repetition of his request, "that some plan for making roads through Bellary may be authorized and commenced upon."

Size and importance of the district.

347. Bellary is in extent rather larger than Cuddapah: in fertility and natural resources it is not less important; and being farther from the sea, and equally difficult of access, it has the greater occasion for a reduction in the cost of carriage: it is one of the greatest cotton producing districts in the Madras Presidency. It is of such a district, be it observed, a country measuring 13,000 square miles, or nearly double the size of the whole of Wales, and containing a population of 1,250,000, that the Collector states that there is but one arched bridge throughout the whole country, out of the town of Bellary.

The loss and impediment to trade resulting from the absence of a road from this immense district to the port of Madras, was strikingly exemplified a few months ago, when freight having fallen to an extremely low point, the cotton of Bellary was in great demand as an article of profitable shipment. There was abundance of cotton in the district; but in consequence of the tardy and uncertain means of transport to the port, the merchants could not venture to send for it, lest shipping should have become scarce and dear before it could arrive; and yet the distance from Madras to the very centre of the cotton country is not more than 250 miles.

The roads of Kurnool.

348. The first report upon the communications of Kurnool by Mr. Septimus Scott, in 1846, mentions two lines of road ("though," as he observes, "they scarcely deserve that denomination") which pass through the district, and lead into the town of Kurnool. The roads are said to show no indication of ever having had any money spent on them, and are now, for the most part, "little better than tracks through the fields, marked out principally by their being worn down to a lower level than the surrounding country, though here and there the hedge of a field or a few trees mark the line. In dry weather these roads are said to be easily travelled, but in wet weather, where the soil is rich, the roads have little advantage over the field, to which, in many places, they form the channels for drainage." Mr. Scott adds, "there is not a single bridge in the whole country, and as no sanction has yet been received for the two small ones for which I submitted an application 20 months ago, I have abstained from recommending any other improvements." He recommends a pass being opened through the Nellamulla Hills, which form the eastern boundary of the district, over which at present carts cannot be used.

Mr. Phillips reports in 1847; but having only slight personal knowledge of the district, he says little. Referring to the report just noticed, he says, "since the transmission of that communication, no expenditure whatever has been sanctioned for the roads, and the two bridges for which Mr. Scott then stated that he had 20 months previously submitted an application, and which in my opinion are most obviously necessary, are still without sanction." In 1848 he reports the two small bridges as sanctioned, and one of them in course of execution. He urges further improvements, and again presses upon the Board the necessity of opening a pass through the Neelamullah Hills, explaining that it is a great object to have such a road in that direction as will admit of the inhabitants of Kurnool taking their exportable produce to the coast on carts. In 1849, for the fourth time, and still without effect, he urges on the Board of Revenue and Government the importance of the pass to be made through those hills.

Mr. Lushington's Report.

349. In 1851 a full and valuable report upon the communications of Kurnool was made by Mr. T. D. Lushington, who writes as follows: "Eleven years have elapsed since Kurnool became a British province, and I believe I am correct in declaring that during the whole of that period nothing has been done towards the improvement of the existing lines of communication, beyond the construction of two single arch bridges over two nullahs, involving an outlay of *Rs.* 5,186. On that point no steps have been taken to show the people that they have fallen under the rule of a Government possessing a higher degree of civilization and skill than did their late Patan rulers, of one which attaches importance to the improvement of the means of commercial intercourse, and which has at heart the interest of its subjects.

"The province is small, thinly populated, and generally ill cultivated, with an excessive rate of assessment on much of the Circar land, and the inhabitants are generally in a very impoverished condition; but notwithstanding these disadvantages, and the large drafts upon its revenues to meet the very liberal allowances granted to the relatives and dependents of the late rulers, the expenses of a regiment of native infantry, and the Rissala of Kurnool irregular horse, it cannot be regarded as one which does not furnish its fair quota to the general expenses of the State. On examining the revenue accounts for the last seven years, I find that, after the payment of every expense within the province, upwards of 16 lacs have been remitted to the Presidency as surplus revenue; and, as pensions continue to lapse, the annual amount may be expected to increase. I mention this fact, because I am about to express my hope that a spirit of liberality in regard to roads and other important public works, similar to that which has so frequently been shown to newly-acquired provinces on their falling under the Company's Government, may be now extended to Kurnool; for which, irrespective of the repair of works of irrigation yielding a direct return, so little has hitherto been done."

He points out many important improvements immediately necessary, and lays great stress on the pass through the Nellamulla Hills mentioned in every report of his predecessors. Indeed, he considers one insufficient, and gives his reasons for suggesting a second. While pressing this upon the Board, he says, "it is difficult to conceive a district running almost parallel to the coast, and only 80 miles in a direct line from the nearest point, more entirely cut off from all such communication with it as the requirements of progressive civilization demand, than the district of Kurnool."

The roads of North Arcot.

350. Bad as the communications are in North Arcot, and though the district is without cross-roads, it has a great advantage over all the districts above reviewed, in having one comparatively good road through it from the coast to the eastward. This is the Western Trunk Road from Madras to Bangalore, which traverses the southern parts of North Arcot.

Mr. Lovell, who reports upon the roads of this district in 1847, mentions that road as the only complete line of road to be found. He says, "It is the only one which appears to have been thoroughly made and kept up for any distance." One pass, that of Moogly, is also spoken of as being kept up by a small annual outlay (*Rs.* 2,300), and the road from the foot of that pass to Chittoor, 19 miles, is described as "tolerably good," with loose stone bridges over some of the nullahs. Above the pass, the road has been made as far as Palmanair, four miles; and another road of four miles is spoken of in the direction of Cuddapah from Palmanair; but this small amount of tolerable road-way, which is all in the vicinity of the Collector's

lector's stations, could be made comparatively little use of, the communication being interrupted by the very bad state of the road from Arcot to Chittoor.

More detail of their condition and wants.

351. The report of 1848 by Mr. Bourdillon, omitting detail of the operations under the Road Department on the Great Western Road, mentions several minute expenditures; it also notices that small estimates sent in for the repair of two important approaches to Arcot, one from Cuddalore, the other from Trichinopoly, had been refused sanction on account of the financial circumstances of the time, and points out several roads as urgently requiring improvement. Early in the following year, a more detailed report was written by the same gentleman, in which it is said of the roads of North Arcot, "they are in truth not roads but mere tracks, picking the best way they can through the obstacles they meet with, whether swamps, quagmires, rocks or jungles; many parts in all of them may be fairly styled impassable in the wet season, and even for half the year or more as long as the Nunjah lands which they pass are under cultivation; and though such parts are comparatively firm and level when dry, the rocky and stony parts are equally bad all the year round." It is stated that one important line of trade has altogether disappeared in consequence of the neglect of the road from Chittoor to Vellore. A list of roads accompanies this report, which, exclusive of 194 miles under management of the Road Department, measure 515 miles. To repair these in a satisfactory manner, without, however, any expensive correction of the lines, was estimated in a general way to require *Rs.* 400 or *Rs.* 500 a mile; but as the work must proceed gradually, it was suggested that only 50 or 70 miles should be repaired annually, at a cost of *Rs.* 20,000 a year, which "would be less than one per cent. on the revenue of the district; and that, or double that, would be no extravagant outlay on the communications of the district, from a Government which for nearly half a century had done scarcely anything for them, though it had received revenue from the district during that period to the amount of 10,000,000 *l.* sterling." The Collector, at the same time, urged upon the Board the necessity for more help from the Engineer Department. He required money for carrying on the works that might be proposed; but his first want was engineering skill, to ensure the right lines being adopted, and the best means being taken to overcome the difficulties met with.

The Madras and Cuddapah road.

352. In speaking of the Madras and Cuddapah road, which traverses the northern parts of this district for about 55 miles, and would be a valuable trunk line to it, the Collector says, "The present state of this road is felt to be a very great evil by the native community using it or living near it; frequent and deep complaints of it have been made to me, and the same would probably reach the Board and Government were the complaining parties in a condition to make a joint address, and did they suppose that a petition on the subject would be successful." It will be remembered that the necessity for a better road on this line was repeatedly brought to notice in the reports of the Collector of Cuddapah.

The late Superintendent of Roads considered one road from Cuddapah to Madras, and that a circuitous one, to be sufficient; and the Government, adopting that opinion, appear to have abandoned the idea of doing much to improve this direct line. As regards the town of Cuddapah, and the northern and western parts of the district, that view may be correct; but we would remark, that this line forms a valuable trunk road to the north-east part of North Arcot and the eastern parts of Cuddapah (forming together a country nearly as large as Wales), which do not benefit at all by the Goolcherroo line. It is most important, therefore, that even if the last mentioned line is regarded as the main road to Cuddapah, this line also should be made a good road.

General condition of the roads of the district.

353. In the annual report of 1850, the Collector refers to his letter last noticed, and says, "In my letter of the 26th April 1849, I gave a general view of the existing condition of the roads; it would be superfluous to repeat it here, as no change has taken place, except that the already bad state of the communications is daily becoming worse, under the influence of the usual deteriorating causes, and in the absence of measures to arrest such deterioration."

In July 1850, the Collector addressed the Government direct on the subject of the improvement of some important lines under the Superintendent of Roads, for which he urgently requests that sanction may be granted. He observes, "with the exception of the High Western Road to Bangalore, which passes through a part of this district, and the sums expended on the road from Chittoor to Palmanair,

I cannot learn that any considerable amount of Government money has ever been laid out on the communications of this district, out of the 10,000,000 *l.* sterling that has been drawn from it in revenue during the half century that it has been under the British Government. The state of the roads is just what might be expected from this fact; and their wretched condition cannot but operate most banefully both on the revenue and on the prosperity of the people." And in closing his letter, he says, "The land assessment in this district is very heavy, but good communications would do much to lighten the burden to the Ryots." The roads referred to in that letter were a branch line from the Western Trunk Road through Chittoor and Palmanair to the Mysore frontier, and a road connecting Chittoor and Arcot, being a total length of 74 miles. These roads have since been sanctioned, and their construction is in progress; they will form a valuable addition to the means of communication of the district.

In 1851 the Acting Collector reports some small repairs as in progress on the roads from Arcot to Wandiwash, and from Conjeveram to the same place; he also mentions some activity in the works under the Road Department.

The roads of Chingleput.

354. Mr. Edward Maltby, in his report for 1846, notices the advantages to the Chingleput district from the western and southern roads, both which lines traverse parts of it. He suggests the advisability of opening a number of other roads in the district.

The reports in the following four years by Mr. Freese are very concise. They remark upon the state of the two trunk lines, and explain that the heavy traffic on the western road keeps the surface in bad order. Some slight repairs are alluded to on other roads; and one road, from the Elphinstone Bridge to the southward, which is stated to have been repaired in 1848, is reported in 1849 to be in fair order as far as Trevamore, about four miles. Two cross roads are said to need repair, but of the others in this district Mr. Freese says, in his Report for 1850, that they "are generally in good order, the necessary repairs being performed from the discretionary sum placed at my disposal." This sum amounts to 40 *l.* a year, for an area of 3,000 square miles, containing half a million of inhabitants and several large towns. If the roads of Chingleput could indeed be kept in good order at so moderate a cost, the wants of the country, in general, might be supplied at a small expenditure; but we have ample proof under our own immediate observation that it is not so; even if the very fact that the Collector names four particular miles as being in good repair, did not lead to the inference that the roads of his district generally are out of order. We find that with the exception of the two trunk roads, all the roads leading into Madras (the whole of which lie in the Chingleput Collectorate), are in wretched condition; and as to the very four miles specially stated to be in repair, the driver of a country cart is liable to a fine if he uses the only portion of the road which is gravelled; and it is hardly possible to conceive a worse road in a flat country, than that used by the carts approaching the Elphinstone Bridge, to within 400 yards of the bridge itself.

The line leading direct to Cuddapah, which is the same already spoken of among the roads of the Cuddapah and North Arcot districts, is in some parts in even a worse condition in Chingleput than in those Collectorates, and very much worse, considering the level character of the country. The ruts are in many places a foot deep; and although it leads through the quarry that supplies Madras with road material, and is the very road by which that material is brought in, it has never been metalled. Indeed when the nature of the country is considered, there is not a Collectorate in the Presidency where the traffic is carried on under greater disadvantages than Chingleput, as respects all roads, except the two trunk lines above spoken of.

The roads of South Arcot.

355. The reports on the roads of South Arcot in 1847, 1848 and 1849, are brief, confused and unsatisfactory. Mr. Davis states in these reports that the Southern Trunk Road is under repair by the Road Department; his account of every other road is generally summed up with the words, "but is not impassable." In the report for 1847 we find this paragraph: "The following communications throughout the interior of the district are in a wretched state, and consequently cause great difficulty and inconvenience to merchants and travellers, viz. from Pondicherry to Coleanoor, from Chellumbrum to Shateatope, from Munargoody to Chellumbrum, and from Chaitput to Teroonamalay." This list is repeated, or alluded to, in each subsequent report, with a remark that "they remain in the same state;" and every year the same paragraph is used almost verbatim, viz. "The Superintendent of

Roads

Roads being already engaged in preparing new lines of roads, and suggesting the best method of improving the present ones generally, I am not prepared at present to recommend any repairs." It is to be remembered that the Superintendent of Roads had nothing whatever to do with any roads in the district, except two lines called Trunk Lines, one of them only a few miles in length.

In February 1851, Mr. Wroughton, the Acting Collector, sent in a general report, of little value, except as showing that no improvements were in progress save those on the trunk roads.

In October of the same year, Mr. E. Maltby reports very favourably of the progress making on the two trunk roads; and mentions a new but incomplete road made between Manargoody and Chellumbrum. "The other district roads remained in the same state as at the date of the last report," excepting only that one had been repaired by means of the annual allowance, amounting in South Arcot to 60 *l.*

General view of their state.

356. From these reports we gather, that with the exception of the southern trunk road from Madras to Trichinopoly, with its one branch into the district of Tanjore, there are no tolerably good roads in the whole district, containing as it does 7,600 square miles, and 1,006,000 inhabitants; and as regards the interests and the convenience of the district, probably no line could have been laid out of less advantage than this line, passing as it does north and south through its inland Talooks. The Trichinopoly road is important as a military line of communication, and will doubtless be of some benefit to the trade of the country generally; but the produce of the district must find a market in the coast towns, and there does not appear to be one road in good order in the direction required, viz., from east to west.

The Civil Engineer confirms this unfavourable view of the roads of South Arcot in the following words: "They are totally neglected; a very small share of the attention of the Civil Engineer's Department is available for the roads, pressed as it is with more emergent demands." And the Civil Engineer of the 6th Division, in reporting on the small part of this district which lies within his range, says, "In South Arcot the Manargoody and Chellumbrum road has been constructed, one from the Vellaur to the Coleroon improved, and a few other portions of road have also been repaired, but generally the roads are bad, and our establishments are not sufficient to attend properly to them. The great want in regard to roads is the means of keeping them in the constant repair which they of necessity require. The loss now sustained by delay in repairing roads is very great." There is a canal from the lower Coleroon anicut to Porto Novo, which was designed to be used for navigation as well as irrigation; but we have already remarked (para. 250), that it is in such a state of disrepair as to be very little used for the former purpose."

The roads of Tanjore comparatively very good.

357. The reports from the highly favoured district of Tanjore contrast in a most striking way with those from other parts of the Peninsula. The First Report, written by Sir Henry Montgomery in 1846, speaks of great improvements having been made in the communications of the district in the previous 15 years; but he truly remarks, that though much had been done, the communications were by no means complete. He points out the vital importance of roads, and reminds the Board of a suggestion made some years before, to lay down a railroad from Negapatam to the westward through Tanjore and Trichinopoly; observing, that "there appears no portion of the Madras Presidency which offers better success for a railroad than this line."

Mr. Bishop writes in 1847, and reports still further improvements; one "splendid bridge has been erected over the Cauvery, by his Highness the Rajah (of Tanjore), at a cost of *Rs.* 18,500," thus completing the bridging between Trivady and Tanjore; and several lines of road are mentioned as completed or in progress. In 1848, Mr. Bird, the Acting Collector, writes, "considerable improvement has been effected throughout the province during the past year, in the formation of roads, and the bridging of streams."

In May 1850, Mr. Bishop begins his report in these words, "*Rs.* 40,000 have been expended on various works for the improvement of internal communications, since the dispatch of the report for 1847-48; and the main line throughout the district in general is in a very fair state." In the next report, written in September of the same year, the same gentleman writes, "since the date of the last report, *Rs.* 30,000 and odd have been expended on the means of transit in Tanjore, and every endeavour is made to preserve the existing roads in good repair, as well as encourage the laying out of new lines connecting villages."

The necessity of an allowance for repairs.

358. Mr. Bishop presses on the Board the necessity for a sum being placed at his disposal for repairing roads; the increasing traffic, as he had explained in a former report, causing a considerable loss by wear and tear. "In Tanjore, the difficulty of preserving the roads in repair must be experienced in order to be appreciated; at least three-fourths are raised roads in the midst of paddy land, and gravel is not obtainable except at such an expense as to render its use impossible; under these circumstances constant repairs are required, a single heavy rain cutting deep channels in the sides of the bunds (as the roads may be appropriately called in many places), which require immediate attention to prevent double outlay in repairs at all delayed; for such repairs, and for having a fund at my disposal for other emergent road purposes, I had the honour of soliciting the sanction of the Government, and regret that my proposal met with no encouragement from the Board, as the quantity of gratuitous labour demanded from the Meerasdars is already heavy, and that for the repair of roads may come at a time most inconvenient for them to spare the services of their labourers."

Further improvement still required.

He closes his report in these words, "although the internal communications of Tanjore have been vastly improved of late years, and in general are in good preservation, there is still room for much improvement;" and he adds, "the outlay rapidly brings an equivalent return, by the facility afforded to the transport of grain which must be exported for consumption, the produce of the district exceeding by one-half the home demand."

In 1851, Mr. Goodwyn, the Acting Collector, reports an expenditure of *Rs.* 12,251 on the roads.

The Civil Engineer says, the "district roads in Tanjore are kept in repair by the Meerasdars, but more is required than they can perform."

Reasons of the difference between the roads of this and other districts.

359. When these extracts are read, and it is remembered that the area of this district is so much smaller than that of many of the Collectorates which are without communications of any kind, that it is less than a third of the extent of either Bellary or Cuddapah, the total absence of roads in which we have described, it may be supposed that a better system has been pursued there than elsewhere; but such has not been the case, and great as the improvement of the communications has been, to this day it cannot be said that the roads of the Collectorate are under any fixed system of management whatever. In spite of the absence of good road material in an alluvial tract, and the multiplicity of irrigation channels to be bridged, Tanjore is still, from its even surface, and the absence of jungle and mountain, as well as from its denser population, a much easier country to make roads in than most other parts of this Presidency; but still, the fact that the district was well provided with main lines of communication even before 1846, is mainly attributable to two circumstances; first, the existence of very large temple endowments, far beyond the necessary expenses; and second, to the great fertility of the province, and the consequent prosperity of its inhabitants. It is true that Tanjore has had a succession of very able Collectors, men who knew well the value of good roads, and never failed in their exertions to obtain the means of making them; but we have seen that in other districts, Collectors, however able, and however anxious for the improvement of the roads, have failed to obtain the means of doing anything effectual in that direction.

The large surplus Pagoda funds.

360. Tanjore contains several very large and celebrated temples, richly endowed by the former Hindoo sovereigns of the province. The affairs of those institutions being economically administered by the Revenue Officers of the British Government, a surplus accrued annually, and was placed to the credit of the pagodas concerned, as noticed above in para. 326. These accumulations formed a fund, upon which an improving Collector looked with much satisfaction. Primarily indeed it was available for the repair or improvement of the temple buildings; but it was far more than sufficient for that, and whenever a bridge was to be built, or a line of road to be formed, the Government sanctioned disbursements from this source with a liberality which might laudably have been extended to its grants from its own funds. Most of the principal rivers in Tanjore, and very many of the smaller streams, were bridged by this means, and some important lines of road constructed. Again, the light assessment on the land, and the abundance of water for irrigation, have not only ensured a flourishing revenue, but have added, year by year, to the wealth and resources of the inhabitants; thus they have had the means of aiding in the formation and maintenance of the roads; and as their prosperity brought with it a degree of intelligence not to be found generally in other districts, they

they readily saw how much their well-being depended on good roads to convey their staple produce, rice, to a market, and have been willing to do not a little to keep in repair the roads formed by means of the Pagoda Funds, and even to make roads themselves. They appear indeed to take a pride in the fine roads and bridges of their country; and we find his Highness the Rajah of Tanjore signalizing his liberality, and contributing his share to the general improvement, by giving, from his own purse, the amount necessary for building several handsome bridges.

Another pleasing result of the general wealth of the people, has been the great body of skilful builders and labourers of all classes that can be collected at any point where works are to be constructed; this has given strength to the Engineer, who having also a comparatively moderate area to travel over, has been able to concentrate his energies on each undertaking; and as every great work was completed, more well-taught artificers were at his disposal for the better execution of his future designs.

The roads of Trichinopoly.

361. In Mr. Onslow's report for 1846, he enumerates 23 roads as those of the Trichinopoly district; of which 13 are said to have been repaired by the State at one time or another, *Rs.* 43,590 having been spent upon them in the previous 18 years. Little information is given as to their actual state; but from the subsequent reports of 1847, 1848, 1849 and 1850, it appears that they are in general in very bad order. The only one said to be in thorough repair in 1850, was that from Trichinopoly to the frontiers of the Coimbatore district at Caroor, though some useful efforts have been made each year to improve portions of others.

Captain Lawford, the Civil Engineer, writes as follows: "In Trichinopoly the road to Tanjore has been lately constructed, that to Caroor improved, also one to Laulgoody and towards Arrialore, but the others are very indifferent." As a report upon the roads of a whole district nothing could well be more unsatisfactory, or show more clearly that the roads in general are in a neglected state.

The roads of Salem.

362. Mr. Lockhart reports on the Salem Roads in 1847. He says, "there are five main, and 15 branch roads; one of the latter has lately been formed, and nearly completed;" he adds, that a 16th road is in progress. He explains, that the roads are principally kept in repair by the Bandy Tax Fund; the work being supervised and reported on by the Civil Engineers' Department. He says, "as a proof of the trade being augmented from the improvement in the roads, I have to adduce, that when the tax on carts was introduced in the district in 1836, the number of carts was 1,189; and the number at present kept by all classes of people, is 3,296; exhibiting an increase of 2,107, and moreover bandy hire has been reduced from 14 annas to 8 annas for every 10 miles, and 40 maunds (1,000 lbs.) is now the usual cart-load, whereas before the roads were put into their present state, they carried no more than 12 maunds (300 lbs.) each." Mr. Lockhart states, that the removal of the transit duties has led to a considerable increase in the import of European goods; but that the grain produced in the district is not more than sufficient for the consumption, there being no object in cultivating more, since the want of roads in the districts between Salem and the coast would prevent its carriage to a market.

In 1848, 80 more carts had been registered in the district, the roads were said to be kept in repair, some more bridges and drains had been built, and others were in progress.

Mr. Maltby's Report.

363. In 1850 Mr. F. N. Maltby gives a statement of the made roads in the Salem district, they measured altogether 400 miles, and three other lines were opening, two of which would be paid for by the Bandy Tax Fund, and the other from the grant for Trunk Roads. He says, "of the general state of the district roads I can speak most favourably. The most important are those from the frontier of Mysore to that of Trichinopoly, and from Salem to Ahtoor. There are portions in which repairs are required, especially between Salem and Trichinopoly; but generally speaking they are in good order, and offer no impediment of a serious nature to the country traffic; the avenues are very flourishing, and in this neighbourhood the roads are in excellent repair.

"I would here beg to observe that, from the inland position of Salem, the commercial prosperity of the district is dependent almost as much upon the state of the roads of the neighbouring districts, as on its own. Two of the most important outlets for its produce, are by Ahtoor through the Cuddalore district, and by Valiaputty to Trichinopoly and Tanjore; but those roads which are in

excellent order up to the frontier or nearly to the frontier of this district, may be said almost to cease in those of Cuddalore and Trichinopoly." Mr. Maltby approves of the local tax, but objects to its being considered sufficient for the wants of the district, and being made a reason for withholding such grants from the general revenues of the country as are allowed to other Collectorates, the inhabitants of which pay nothing for the maintenance of their own roads.

In this very favourable account of the Salem roads, Mr. Maltby must be considered as drawing a comparison between them and the cross roads of other districts; for if we compare them even with the much abused road from Madras to Waniambaudy we find them very inferior even to that. On the Salem roads it is Mr. Lockhart's boast that a cart can carry 40 maunds, being 1,000 lbs. weight; whereas on the Western road the common load now is 1,600 lbs., and if it were in really good order the same cattle would draw 200 lbs. more, and fully half as far again as they could take the lighter load on the unmetalled roads of Salem.

The roads of Coimbatore.

364. Mr. Wroughton's report upon the roads of Coimbatore in the year 1846 is accompanied by a statement showing that, in the last 10 years, the sum spent on repairs has only amounted throughout the district to *Rs.* 2. 11. 9. per mile of the roads called made. What had been spent during that period on the formation of new lines and on bridges is not stated. Of the condition of the roads in general he says, "the roads of this district are not in good condition; and probably not worse than the general run of roads in India, or so bad as to seriously obstruct the passage of wheeled conveyances, except in a very few places; the only exception to this is the one proceeding to the Neilgherries from Coimbatore." Mr. Wroughton goes on to say that the Madras road to Coimbatore is very bad; that the Trichinopoly road is in the same state: that the one from Coimbatore to Sattimungalum is in need of urgent repairs, as is also the one from Coimbatore to Polachy, while the road from Bowany to Chickagazanoor "is in many places impracticable for carts." We cannot gather satisfactorily from this report, what the state of the roads actually was; but the lines specially mentioned as bad or impracticable, are amongst the most important in the district. The real condition of the country, as to its means of communication, may perhaps be better understood from the report of the Sub-collector, Mr. C. J. Bird, who says, that in spite of the neglect of the roads, carts in general proceed "without much difficulty;" adding in another paragraph, that "by far the greater number of villages are approached by narrow lanes, between thorn hedges, many of which are so narrow that even a loaded bullock cannot pass along without brushing his pack against the thorns on both sides." On this account he considers that much of the utility of the broader road is lost, as the cultivators must keep pack oxen for the greater part of their carriage, and cannot afford bandies also for the limited space they can be used upon. In his concluding paragraph, Mr. Bird remarks on the evil effect of this want of roads practicable for carts, as seen in a late season of scarcity, when the cost of carriage greatly enhanced the already high price of grain. In 1848, neither Mr. Wroughton's nor Mr. Bird's report shows any material change in the state of the roads.

Mr. Thomas's Report.

365. Mr. Edward Thomas reports in 1849 that there has been an expenditure on the 510 miles of main road in the low country, amounting on the average of the whole to *Rs.* 10. 6. 2. per mile; and on the Neilgherry roads and passes, the outlay has been *Rs.* 70 per mile. A most valuable improvement is mentioned this year, the formation of a new road from Coimbatore, to join the important line opened several years previously through the district of Malabar to the port of Ponnany; a statement of the trade of the district accompanies this report from Coimbatore, as had been the custom previously; but Mr. Thomas observes, that the returns "must have been drawn up (by the Thasildars) on insufficient and inaccurate data, and are not much to be depended on;" which being the case, we do not think it advisable to quote from them.

In 1851, Mr. Thomas commences his report with a satisfactory account of the completion of the Walliaur line, referred to in the report for 1849, at a cost of *Rs.* 27,894; short as it was, only 16 miles in length, this was a most important improvement to the district, completing a good road for wheel carriages from Coimbatore to the Western Coast; a work which had been a desideratum from the time this fine province came under British rule, more than half a century ago.

Another

Another great improvement throughout the district, is also mentioned in this report: the repair of a great extent of the minor roads, by means of sums which had accumulated in the Treasury, the surplus income of the temples and endowed Choultries; this is a most valuable boon, and is being turned to the best account. Mr. Thomas brings to notice a bandy tax existing in Coimbatore, of which no mention is made in the reports of his predecessors. The amount of the tax, it appears, has been absorbed in the general collections, while a similar impost has been the means of much good in the neighbouring district of Salem, as a fund for repairing the roads.

The roads of Canara.

366. The reports from Canara are more satisfactory than from any other district; for though there are still but few branch roads, no good means of communication parallel to the coast, and almost no cross lines practicable for carts, the district has some very fine passes leading from the interior of the Peninsula to its sea-port towns, which are the real trunk lines of trade, and such as should in all cases be the first opened.

Mr. Blane, in his first report, writes as follows: "The Board is aware that much attention has been paid within the last few years to the roads in Canara, and large sums have been sanctioned for opening the communications with the interior. The amount of estimates sanctioned and now under execution, is *Rs.* 1,74,540, but the greater part of these works are as yet unfinished, and the benefit which will result to the trade will not be fully developed until their completion." He gives an account of a line of road (the Sumpajee Ghaut) practicable for carts throughout its entire length; another pass (the Agoombie Ghaut), he says, had been completed about seven years, but was still little used by carts, in consequence of the roads leading from its foot to the coast not being opened; and two others, the Coloor and Devamunny, were then under execution. These were all cart roads; and in addition to them, he mentions the Neelcoond Ghaut, which, although only practicable for cattle, had a greater traffic on it than any other, but was likely to be superseded by the Devamunny when that was completed, such being the object of the new pass. In conclusion, Mr. Blane points out a number of other roads urgently required, stating that "there is no want of places where they" may be undertaken with the greatest benefit to the internal trade and to the country generally. In the same gentleman's report for 1849, further progress is shown, but still the Sumpajee line is said to be the only one by which there is a perfect communication with the interior by means of carts. Several other important works are, however, stated to be "approaching their completion."

Mr. Maltby's Reports.

367. The third report from Canara is from Mr. F. N. Maltby, who, having been Sub-collector in the district before the passes were opened, was able, on rejoining it nine years after as Collector, to judge fairly of the effect of the work carried on during the interval. This report is so satisfactory and brings to view so clearly the beneficial results of improved roads, and even the direct profit to Government from them, that we have thought it advisable to give the whole of that part of it which details results, and it will be found in Appendix (J.)

For the same reason we have given (Appendix K.) Mr. Maltby's answer to us regarding the roads of Canara; which is still more clear as to the profits to Government by the improved roads, both in land revenue and that from the salt monopoly.

In 1838, as Mr. Blane notices in one of his reports, there was not a single cart in all Canara, the roads not admitting of the use of wheels; now we find carts largely employed on six mountain passes, and some very important branches from the main lines also in a fit state for cart traffic; indeed so great a change has been effected in the country, that Mr. Maltby was able to make his circuit through a great portion of the district in his carriage, ascending to the plain of the Mysore country, and even crossing from one trunk line to another without difficulty. The good that has been effected by these roads is shown in the papers above alluded to; and the whole sum that has been laid out in the 13 years, 1838 to 1850, in bringing about this great improvement, has been *Rs.* 5,25,000, of which no less than *Rs.* 2,76,468 was spent on the single Sumpajee Ghaut, under great disadvantages from frequent change of management.

The communications are still far from complete.

368. It must not, however, be supposed that Canara has its communications complete; when its mountain-passes were examined between 1842 and 1846, there were found to be 25 used by laden cattle, though only passable by such as were accustomed

accustomed to the work. It cannot be supposed that the six new passes will be sufficient substitute for these. Doubtless, much of the traffic which formerly took a direct line by those rugged paths, will now reach its destination more cheaply by a circuitous route on bandies; but that circuit is a loss which may be overcome by opening other passes, and that at no great cost. Nor are the wants of the district confined to the passes only; branch lines are required all over the low country, converging westward to the shipping ports, and eastward to the passes. There is still a great portion of the coast line without a road; the drainage of the country crossing it has none of it been bridged; and the ferries are not so good as they are in Malabar. There are in several parts of the district, both in the northern and southern Talooks, great facilities for inland navigation, by the artificial junction of the back-waters, which now only obstruct the traffic of the country, whereas they might be made very greatly to assist it; these lines would extend chiefly in a direction parallel to the coast, but each river or back-water has some length navigable for boats, in the direction of the hills. A first step has been taken to facilitate transit in the Canara district; and that having been so eminently successful, there is the greatest encouragement to continue the work.

Mr. Maltby makes one proposal as a suggestion, which he might claim as a right: he asks to have the disposal of the surplus ferry funds for the improvement of the roads. The Honourable Court's Despatch of 3d September 1817, already adverted to, expressly devoted those funds to this object, but the order has never been acted on; the ferry funds have never been so employed, but have been uniformly merged in the general revenue; we shall recur to this subject presently.

The roads of Malabar.

369. Mr. Conolly, in 1848, mentions two carriage roads in Malabar, one from the borders of Coimbatore to the coast at Ponnany, and one by the Peria Pass, from the Mysore frontier to Cannanore and Tellicherry; he names also four other mountain passes practicable for cattle, and leading directly into the interior. "There is also a coast road generally available, though in parts very difficult for carts, from one extremity of the district to the other." "Besides this, there are a vast number of secondary roads intersecting the district in various directions;" very few, if any, of these are, however, practicable for carts. Of the other roads, he says in another place, "I have little to say of the coast or other minor roads; part of them have been improved from time to time, but nothing has been effected on a grand and general scale, such as evidently was the intention when the Board called for the detailed information adverted to above."

In his report for 1851, Mr. Conolly mentions the new Perumbaddy Pass (alluded to in our Report upon the Trunk Roads), as "not quite completed, but in good working order throughout." The other trunk road, from the borders of Coimbatore to Ponnany, is, he states, "working admirably." Of the cattle passes he reports that they are maintained with the annual allowances sanctioned for them respectively.

Water communications in Malabar.

370. Mr. Conolly does not notice the improvements made in the means of transit, by cutting canals to connect some of the extensive back-waters of the district; but it is proper to mention them here. The cuts were three in number, to the aggregate length of 21 miles, and at a total cost of *Rs.* 29,904. Though their own length is so little, yet, with the intervening back-waters, they form a connected navigation 90 miles in length. These works were sanctioned during Lord Tweeddale's Government, and besides greatly promoting trade and intercourse in general, they are of great importance to the district in facilitating the transport of grain from the southern Talooks to those in the north, the staple of which latter is pepper. The canals are very narrow, and sufficient only for the very small boats in use; but it will, no doubt, be most advisable to improve them eventually for steam navigation. It was a part of the original design to unite in one continued navigation the back-waters of Malabar, Cochin and Travancore, from Baragherry to Quilon, a distance of above 200 miles; and the project for this purpose was sent in by the Board of Revenue for the approval of the present Government. It consisted of the cutting of a canal, and the improvement of a back-water, for a distance of 15 miles, involving an expense of *Rs.* 8,995 (900 *l.*), but the Right Honourable the Governor in Council saw "no sufficient reason for incurring the expense." He was also "of opinion that the time and attention of the Civil Engineer should not be called off from more important works by projects of this character;" but it would be difficult to find a project holding out more important results than this, and at such an utterly inconsiderable cost of either time or money.

371. But

371. But though Malabar has now two good carriage-roads through it, leading into the interior of the country, and some good miles of metalled road near the coast, with very efficient ferries throughout the district; and though it has what few other districts have, fixed annual allowances for the maintenance of its mountain passes; and though it has nearly a hundred miles of inland navigation; yet, in one respect, it has been worse used than any district of the Peninsula in regard to its internal communication, because the surplus income from ferries, accorded by the Honourable Court for the promotion of local improvements, but withheld by the Government, is larger in this district than in any other: we shall advert to this subject presently. We will here conclude our remarks on the roads of Malabar, by observing that the present state of that district brings before us in a painful way the consequences of omitting to use this or other means to open the interior of the country; and were the Government under the necessity of sending troops through the district to overawe the Moplah population, they would find that the want of roads added a hundred-fold to the difficulties and losses. From its steep wooded knolls and deep swamps, Malabar is naturally one of the most difficult countries in the world to march an army through; and as each considerable house is surrounded by a wall, and each garden by a ditch of great depth, it is hardly possible to imagine a country where troops would move to greater disadvantage. As it now stands, it is almost every where inaccessible to artillery, from want of roads of sufficient breadth for the axle of a gun-carriage; cavalry could not be employed; and infantry would in many parts be obliged to advance in single file, commanded on all sides by jungle-covered eminences. But a still more important consideration is, that if the country had thus been opened by good roads, the likelihood of any military operations would have been very much diminished; for the same national energy of character which now impels the Moplah cultivator of the secluded village to martyrdom, would then have been turned into the peaceful and beneficial channel of active enterprise in trade, as we find so eminently the case with their brethren on the coast; and the ignorant and mad enthusiasts of the Ernaud Talook would be found displaying the same care for security of life and property as the thriving inhabitants of the coast towns.

The surplus ferry funds in Malabar.

372. Mr. Blackburne, who, like Mr. Orr in Salem, gave his constant attention to the roads of his district, writes a detailed account of the roads in Madura in 1846; but full as the statement is, we cannot gather from it what was the actual condition of the lines he writes of. Some are said to be "excellent," some "good," some to contain all the grades "from bad to good," and some "to be sufficiently passable, &c." We believe, however, that all the roads he speaks of are practicable for wheel carriages. Mr. Blackburne reckoned altogether 1,472 miles of what he termed principal roads as existing in 1840; between which time and 1846 he brought to completion, without any expense to Government, another line measuring 65 miles. Upon the whole, it is evident that the roads of Madura were in better order than in most districts, and that the Ryots gave assistance both in making and repairing them, when called upon to do so. The amount of unpaid labour employed, is not stated; but Mr. Blackburne, speaking of No. 4 Road, says, "I fear a small annual outlay may be necessary to meet the wear and tear which cannot, on such a road as this, be sufficiently met by the forced labour of the agriculturist." As there is no annual allowance for the maintenance of the 1,500 miles of road, it is evident that the work done by the villagers must be very great, if the roads were really kept in repair, which they are not.

The roads of Madura.

Mr. Parker's reports, for 1847 to 1851, on the roads of Madura, are all in tabular form, giving the improving or declining condition of each line, with the expenditure for the year. From these reports it appears that the 23 roads named in Mr. Blackburne's list are in fair order; and the Civil Engineer's account of them is as follows: "The roads in Madura district are in very tolerable order; a good deal of attention having been bestowed on them by the late Principal Collector (Mr. Blackburne), and considerable sums sanctioned from time to time for their repair." It must not be supposed, however, that the roads of this district are in a condition to bear any but a light traffic, or that they can be used without impediment all the year round; they are neither metalled, nor by any means fully bridged. The sum spent upon them in the six years, 1845 to 1850, was *Rs.* 56,374, being at the rate of *Rs.* 6¼ a mile per annum. This, however, includes the cost of improvements, and bridges built; and in point of fact, so far as the roads are kept in repair, it is chiefly by the unpaid labour ("forced labour" as Mr. Blackburne calls it) of the Ryots.

The roads of Tinnevelly.

373. Mr. Parker, the Acting Collector, reports upon the roads of this district, in 1846; he says: "In the Tinnevelly district there are two main, six smaller, and six branch roads." One of the main lines, which is a part of the road from Madras to Quilon, he reports as undergoing repair in certain parts, in others to be still impassable by carts after rain, "and in consequence of the state it is in the tappal arrives at Palamcottah frequently two days after the regular time." And this although the tappal (post) is carried by men on foot, which mode of conveyance is of course less affected by the state of the roads than any other. Of the other main line, that from Madura to Quilon *viâ* Ten-causey, he reports 24 miles as requiring to be made, 7 miles to have been made in former years, 44½ miles to be in a bad state, and the remaining 63 miles as requiring "no very urgent repairs." This road, he explains, besides "connecting several Zemindaries or large villages, leads to the passes into Travancore, and is the route of a considerable portion of the trade with that country, which in piece-goods and betel-nuts is considerable." The descriptions given of the six smaller roads show that two of them have been repaired, and are in fair or good condition; and that carts can be employed upon the others, when the country is dry, but that there are parts of each impassable after rain. The six branch roads spoken of, are very short and incomplete; one of them is one mile in length, another 10, and so on. Mr. Parker concludes with an earnest recommendation that a yearly sum may be allowed to keep the made roads in good repair. This is the measure which has been fully approved and enjoined by the Honourable Court; but it is still a desideratum in Tinnevelly and everywhere else, with few exceptions.

Subsequent Reports.

374. In 1847 Mr. Elton, Acting Collector, reports some small repairs in progress; one estimate sanctioned so far back as July 1842, was only just acted upon, although its amount was but *Rs.* 3,313; in another case an estimate of *Rs.* 3,770. 8. had been sanctioned in March 1844, and the work was still in progress in 1847. In striking contrast to the road-making operations of Government in the district, Mr. Elton mentions two bridges, costing together *Rs.* 90,000, built at the charge of two native gentlemen. The annual report for 1848 is by the Collector, Mr. Edward Thomas, who speaks of some very slight repairs in progress, and recommends greater improvements. In 1849 some more extensive repairs are noted, as in progress on the first of the two main roads above specified, but there does not appear to have been any idea of bridging and completing the line throughout: of the second road, it is said to be "in the same bad state as reported in previous years." No account is given of minor roads, as no change has taken place in them beyond such as might be expected from wear and tear. In 1850 the amount stated to be expended on the repair of roads is about *Rs.* 19,000, which has been laid out on four of the 12 lines enumerated in all previous reports as the roads of Tinnevelly. Mr. Bird mentions, as a step in advance, that 25 roads have been "selected and numbered" by the Civil Engineer.

The maintenance of the roads by the Ryots.

375. In 1851 the only expenditures from the Government Treasury mentioned by Mr. Bird are one or two items, amounting together to about *Rs.* 8,500. With regard to the repair of the cross roads Mr. Bird says, "with reference to the concluding part of para. 8 of the Minutes of Consultation, dated 11th February last, I have the honour to state that the Ryots have shown no disposition to maintain the branch roads in repair; and, indeed, unless they are first put into good order at the public expense, it is not within the means of the inhabitants along the several lines to place them in anything like an efficient condition." It must not be inferred from this passage, that the inhabitants of Tinnevelly are backward in giving aid for the improvement of the communications. We have seen that individuals have spent very large sums on bridges; and a further letter from Mr. Bird, shows that, generally, they are willing to come forward in a liberal way. He says, "My letter of the 27th August 1851, will have informed the Board that a number of wealthy individuals have united to raise funds for erecting a bridge, estimated to cost *Rs.* 10,708. 4. over the Chittaur, on Road No. 2; and I am happy to add that a small bridge is now in course of erection on the same road, over a channel at Ramiamputty, near to Tinnevelly, on an estimate, including some earth-work in its neighbourhood, of *Rs.* 535. 2., being part of a sum of money in dispute between two parties, who agreed to have it applied to the above purpose. Subscriptions are also being offered to build a smaller bridge at a cost of about *Rs.* 2,000, on the new line between Ten-causey and Shencottah." But as Mr. Bird truly says, the Ryots cannot and will not make the roads; that must be done by Government.

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The utmost that can be expected of the Ryots is to perform ordinary repairs, and even that not to the main roads, but only to the district or local roads.

376. In 1846 a lac of rupees had been set apart from the surplus pagoda funds, as we have already mentioned, for the purpose of constructing a road to connect the cotton district of Tinnevelly with the shipping port of Tuticorin. The estimate amounting to *Rs.* 1,00,463 was sanctioned on the 16th April 1850; but in his report for 1851, the Collector states that no more than *Rs.* 9,030 had been expended. Four years were consumed in deliberating on this project, and the labours of the fifth year have effected the execution of less than one-eleventh part of it: at this tardy rate of progress it will take at least 10 years more to complete the work. The road from the cotton district to the port.

The Civil Engineer reports upon the roads of Tinnevelly at the present time as follows: "They are, with one or two exceptions, but little more than bandy tracks; the high road from Madura to Palamcottah and Travancore, where it has been made on proper principles, is in very good order, and there will soon be a first-rate trunk road from the cotton districts to the port of Tuticorin. I have neither the time nor the subordinate agency for giving the district roads their proper share of attention." The Civil Engineer's opinion.

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377. Such is the purport of the Collectors' reports; and from it we collect the following general sketch of the present condition of the roads of the country. In 1846 there were 3,110 miles of road called made road; but a large part even of this small extent was unbridged and totally unmade, consisting of tracks over a firm soil, not considered to need making for the light traffic then using them. The extent of made road constructed since that time has been very small indeed; in fact, scarcely any additions have been made except the southern road, some passes or roads in Canara, a few miles of the cotton road in Tinnevelly, the road from Arcot to Palmanair now in course of formation, and a few short pieces of road in other parts of the country, the whole probably not exceeding 400 miles. And the term "made" must be understood in a very low sense: at this time there is probably not a single mile of road throughout the territories under this Presidency equal to an ordinary English turnpike road, and certainly not above 1,000 miles over the whole extent of the country, on which it is possible to travel in a wheel conveyance at the rate of six miles an hour with any degree of comfort. General view of the condition of the roads.

378. Many of the most important lines of communication have been entirely neglected. Beyond doubt the lines on which there would naturally be the greatest traffic are from the interior of the country to the coast; because, as the products of the several inland districts bear a general resemblance, there is little occasion for interchange between them; whereas, the products of the coast are every where different from those of the interior, and the coast is the place where home and foreign commodities naturally meet. Yet, for a distance of 650 miles along the coast, from the Cuttack frontier to Madras, there are only two lines running inland; viz. the road from Masulipatam to Hyderabad, which is in such a state as "not to be used without difficulty even in the dryest weather;" and that from Nellore to Cuddapah, which appears to be still worse. So much indeed has the value of roads in that direction been overlooked, that but few of the Collectors of the northern districts from Ganjam to Nellore notice the subject, and all give the most prominent place in their reports to the northern road, a line of very little commercial importance; and this apparently only because it is known as a road, while the others can hardly be called so at all. Many of the most important commercial lines have been utterly neglected.

379. And the condition of many of those which are considered as the great military lines is even more disgraceful in one point of view, because the necessity of these at least has been recognized. The northern road is one of these, and so are also the road from Masulipatam to Hyderabad, and from Madras to Cuddapah. The condition of the first is described in the Collectors' reports; in one part it is hardly distinguishable from the rice fields through which it passes; in another it traverses cotton ground, and is hardly passable in wet weather; in a third, a gentleman was four hours going seven miles upon it on horseback; and in a fourth, it passes through a swamp four miles broad, and is impassable even for laden bullocks for several months in the year. The Masulipatam and Hyderabad road is of still And many of the great military lines are little better.

still more importance. Masulipatam and other places higher up the coast may be reached by sea, and the difficulties of the land march may thus be avoided; but the road in question is the only means of reaching the large military posts of Hyderabad and Nagpore. Yet what is the condition of that road? it is described in two lines by the Collector of Masulipatam: "it may with truth be said to be in many parts impassable in the rains, and not to be traversed without difficulty and danger in dry weather." This is a great inconvenience even in time of peace, making the relief of troops at the important stations just mentioned, and the conveyance of military stores to them, difficult and expensive: in case of warlike operations these evils would be much magnified. As to the third road, that from Madras to Cuddapah by the Nuggery Pass, its badness has become proverbial even among Madras roads; it is described in the reports above given as "the very worst in the Madras Presidency;" and, again, its condition is stated to be "felt to be a very great evil by the native community using it or living near it." It passes through a difficult country, hilly and rocky in some parts, low and swampy in others; and there is probably not a bridge or an embankment, and hardly a culvert throughout its whole length of 160 miles. The very urgency of its need of repair has prevented its obtaining any; for the estimates repeatedly prepared with that view were of necessity large in amount, and sanction was refused in consequence. Of the other military lines the chief are the Western Trunk Road to Bangalore, which is in very good order by comparison, and the Southern Trunk Road to Trichinopoly, which is now in course of formation; the Road Department is so weak, however, that about 150 miles of this latter road have occupied six years to make.

The roads of the country generally.

380. As to the roads of the country generally, the district or cross roads, those by which produce must find a market, it can hardly be said that any exist; with the qualified and partial exception of the three districts of Salem, Tanjore and Madura, of which the chief lines of their own internal communication are in comparatively good order, and that of Canara, which is provided with several good lines passing through it from the sea to the Mysore country above the Ghauts.

With these exceptions, it cannot be said that there are any roads by which produce can be brought to a market from points off the line of the very few main or trunk roads above spoken of as being comparatively good. For the most part the tracks by which carts travel have never been in any sense or degree made or improved, but are such as the carts have been able to strike out for themselves, winding their way as best they can through the natural obstacles of the country, which are in some parts greater, in others less; in some parts rocks and hills, in others swamps and muddy streams, in others rice flats and irrigation channels. Through or round or over these various difficulties the carts find their way as well as they can, changing their line from time to time at particular points, as the old track there becomes impracticable, and gradually deviating more and more from a straight line. On such roads the carts can only carry one-third of the load that they could on a good road, and travel one-half the distance in a day, and there are many days in the year when they cannot travel at all; and all perishable goods, sugar, cotton, and even grain, are much exposed to damage.

The roads of Bellary.

381. The district of Bellary is nearly double the extent of the whole of Wales, and a great part of the country is of "cotton soil," as it is called, a black loam, peculiarly ill suited to travelling, as it opens into wide cracks in dry weather, and is excessively miry in wet; yet in that extensive province there is only nine miles of made road, and not one arched bridge out of the station of Bellary, the not arched bridges being drains or culverts over the smaller irrigation channels, roofed with slabs of stone, and seldom exceeding a yard and a half in breadth. A reference to Appendix (W.) will show that the amount annually expended by Government on the roads of this valuable province, during the last 25 years, was *Rs.* 2,180, being at the rate of less than one-tenth per cent. of the revenue drawn from the district: during the last 10 years of the period the expenditure has slightly increased, being on the average *Rs.* 3,461 a year, or about one-seventh per cent. on the revenue. The Cuddapah district is of similar size, or more than a fourth of the extent of England, and with a population of a million and a half of persons; and here, too, a large part of the surface is cotton soil, and another large part rugged and mountainous. In this district the whole extent of made road is 22 miles, and it is very little better off for bridges than Bellary. Such is the condition of these two fine provinces; in their whole extent of 26,000 square miles, being more than half

The roads of Cuddapah.

half the size of England,* they possess only 31 miles of made road, the whole remainder of the roads being in the state described in the last paragraph, and in large portions of the tract wheeled conveyances are unknown.

382. Such is the state of the communications in the extensive countries forming this Presidency; a condition necessarily fatal to any attempt at improvement in wealth. We have not exaggerated the case; we take Bellary and Cuddapah as examples of the state of the country generally, on account of the large size of those districts; and we believe that with the exception of the few districts already named as better off for roads, their condition as to internal communications aptly represents that of the country at large; and whether we look at the tone and sentiment of the Collectors' reports, or at the views of Government as expressed in their orders upon them, we see no prospect of any material improvement. We fully admit, that compared with the work done in any similar period previously, much has been accomplished within the last 10 years. But it seems considerable in that contrast only; compared with the requirements of the case, the only just comparison, all that has been done hitherto is quite insignificant, so that at the present rate of proceeding it is absolutely impossible to calculate when the country will have anything deserving the name of a system of internal communications.

The tone of the Collectors' reports is not satisfactory;

Among the Collectors we find one here and there who evidently understands the full value of roads, and is urgent that something decisive should be done to improve those of his district; but in general there is a want of a full apprehension of the importance of the subject; some officers speak of some few lines as though those constituted the whole roads of their districts respectively which need attention; one gentleman describes "his roads as not worse than the general run of roads in India;" another admits that all his roads are in a ruinous state, but every year he is unprepared to suggest improvement; a third states that the roads of his district, 3,000 square miles in extent, are kept in good repair at an outlay of 40 *l.* a year. In general there is no attempt to take up the subject as a whole, or to exhibit the actual state of the roads as they are, prominent mention being only made of some one or two lines, of the sums that have been expended, and of the small improvement thereby effected. We find no comparison attempted between the roads here and in other countries, nor are any statistics given, except in a very few instances, of the traffic on different lines, or any data by which to judge of the rise or decline of trade, as roads are improved or neglected.

383. And the tone of the orders of Government on these reports is still less satisfactory; still less encourages any hope of decisive improvement hereafter. The object most conspicuously observable in them is to get rid of the papers. No real interest is exhibited in the question; no anxiety is evinced to call forth the zeal of officers, or to promote improvement; no help is offered to those officers who display a strong desire for the improvement of their districts in this respect; no interest is manifested in the pictures which they draw of the want of roads, or any sympathy in the feelings with which they cannot but look on the reality daily before their eyes; and on the other hand there is no word of disapproval, of admonition, or of instruction, for those who have no eyes for these vital wants of their districts, or who, seeing them, are indifferent, and make no effort or suggestion for their removal. In short, these orders afford no evidence of any real sense on the part of the Government, of the entire absence of roads, or of the social backwardness and disability which such a state necessarily implies, or of the intimate connexion between the state of the communications and the revenue, or any real anxiety to promote their improvement. On the contrary, there is a manifest unwillingness to recognise the real wretched state of the communications as detailed by some Collectors—a disposition to make the most of the very small improvements reported, or aid afforded by Government, and an anxiety to throw upon the people themselves the task to which they are utterly unequal, of improving the roads.

And that of the orders of Government upon them is still less encouraging.

As instances to prove the indisposition to improvement on the part of Government, we may advert to the refusal in the case of the roads from Berhampore to Russelcondah (para. 333), and from Samulcottah to Cocanada (para. 336). Both of these were cases in which strong special reasons were present, in addition to the general

* England, exclusive of Wales and Scotland, is stated by M'Culloch to contain 50,387 square miles.

general reasons of policy in all cases, yet they were refused, the latter entirely, the former to such an extent as to make the road useless for one-third of every year.

The Government overrate what they have done for the roads.

384. And Government certainly over-estimate the value of the efforts and the sacrifices which they have made, misled apparently by a too limited view of the sphere of operations. Thus, in speaking of the northern road, they refer to various sums sanctioned in the course of several years, and amounting on the whole to *Rs.* 56,625 (5,662 *l.*), for the improvement of the road; but it is apparently forgotten that the whole length of this road is little short of 700 miles, and that though 5,662 *l.* may seem a large sum looked at by itself, it becomes utterly insignificant when regarded as the whole expenditure in four years on such an extent of road; and this not to keep in repair a road already made, but for the most part to make one where there was none at all before, and not only no road, but a surface much worse for traffic than many parts of the country where there is not even the name of a road. But whatever may be thought of the magnitude of the grants, the simple fact of the actual state of the road as already described (para. 379), is quite sufficient to silence all self-gratulations upon it.

Again, on another occasion, the Government quote seven grants made in the course of two years for a variety of works, amounting in the aggregate to *Rs.* 29,535 (2,954 *l.*), as proof that they are prepared to sanction the improvement of the district roads, when fitting occasion is shown. But this too must surely be said in forgetfulness; for if it had been recollected that the subject has to deal with a country nearly three times as large as England, and possessing a population one-fourth larger, a boast would hardly have been made of an outlay on the roads of such a country, which many single parishes in England incur constantly, and not at all as anything extraordinary.

And they overrate the improvement effected.

385. And as they over-estimate the means employed, so also they greatly overrate the progress made. It is great when compared with those years in which nothing at all was done; but we see nothing in the operations of any single year, or any single district, that gives the faintest hope that the present system can supply the great desideratum of cheap carriage generally. Such comparisons as are often made between improvements in different districts, or between those of different years, are dangerous: they stand in the place of those which ought to be made between the state of the communications in this country and in England, or even in the most favoured parts of the Company's possessions in India. No one talook, as yet, has nearly roads enough for its wants; and the improvements made, though they appear considerable when taken singly, are very partial: they affect only a few districts, and that very partially, while they leave the country, generally, unaware of their existence. Ganjam, Vizagapatam, Rajahmundry, Masulipatam, Guntoor, Bellary and Kurnool, with an area equal to that of England, know nothing of the late improvements; nor do many other districts, except over an extremely limited portion of their extent.

The main roads cannot be made or maintained by the people.

386. A point much dwelt upon in the orders of Government is that the people, *i. e.* the Ryots, should make the roads; and it is declared that if they will do so, the Government will be willing to aid them. It is very desirable, we may even say it is essential to a complete system of communications, that the people should perform their part in forming and maintaining them; but their part in the work is quite distinct from that of the Government, and all that has been attempted yet is very far within the latter. We contend that the Government ought to make and maintain the main roads, not only of the country at large, but of the several districts, *i. e.* those connecting principal towns or points in the same or contiguous districts; and that the duty of the Ryots is confined to the formation and preservation of the village roads connecting the outlying parts of the country with such main lines. More than this they cannot fairly be required to do. In countries where the rental of the land is in private hands, the whole charge of the roads may properly be made local; but in this country almost the whole rent is taken by the Government, thus they have a far greater interest in improving the roads than the Governments of other countries, and they also absorb a very large share of the means of doing it. In other parts of India, this duty or interest on the part of the Government has been recognized, and in the North-West Provinces in particular, enormous sums, such as have never even been dreamed of in this Presidency, are expended on the great lines of communication. This one fact decisively settles the question of right; for if this is done in North India, where the Government demand

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on the land is so moderate, much more must it, in common fairness, be done here, where the land-tax is so much more burdensome.

The very fact that the idea is even entertained of devolving the chief part of the task of maintaining the roads upon the people, proves a most inadequate conception of what is required; for no one having a correct idea of the extent of road required, would think of laying the burden of making it on the people; and no one taking an enlarged view of the vast benefit certain to accrue to Government from a good system of roads, could object to that Government bearing its fair share of the expense.

The results of such a system:—In Tanjore;

387. The districts of Tanjore, Madura and Salem are pointed to as examples to be imitated by other districts; but if we examine these cases, we find nothing in them to lead us to hope much from the unpaid system. We will briefly investigate the results in each of those districts, and we will first take Tanjore. The improvement or transformation of the roads of that district has been effected, for the most part, within the last 20 years, and it has been less the result of unpaid effort than, perhaps, is thought. During the term stated, the average outlay by Government on the roads of the district has been about *Rs.* 8,000 yearly; but this is not, by any means, the whole of the extraneous aid; this single district received no less than *Rs.* 1,58,519 out of the accumulated Surplus Pagoda Funds, divided after the severance of the Government connexion with the temples; and before that time, the assistance derived from the same source was very large, probably not less, on an average, than *Rs.* 15,000 a year. All these large sums were spent, for the most part, in building bridges, the earthwork having been, in great part, performed by the Meerasdars, under the constant urging of the Collector. And we may observe that the making of unmetalled roads is a very easy operation in Tanjore, for the country is perfectly level, the soil is a soft and easily worked alluvium; and the process is simply raising a causeway two or three feet in height, and covering it with a layer of sand, always to be found within a convenient distance, in the large irrigation channels: a surface thus formed bears a light traffic very well. And what are the results of this 20 years of exertion, partly indeed by the people, but with very material aid? Tanjore, with an area of 4,000 square miles, has 534 miles of road, such as we have described, not metalled, or capable of bearing a heavy traffic, or such as to enable cattle to work, by any means, to the best advantage, but still immeasurably superior to the common country roads. And it must not be forgotten, in estimating the powers of the voluntary system, that although the Meerasdars have been induced to give assistance towards making this very limited extent of road, they profess themselves unable to maintain it. These roads, though easily made, are also easily injured by rain, and though the labour of the annual repair is trifling compared with that of the formation, the Collector delares that it is too much to be done by voluntary labour, and he is urgent on the Government to grant an allowance for the purpose, and the Government recognize the claim.

This then is the state of things, after 20 years, a limited extent of road has been made, with no inconsiderable amount of extraneous assistance, but it cannot be kept in repair; and all this, be it remembered, under peculiarly favourable circumstances. The district is small in extent, and the population denser than in any other; the roads are easily made; the assessment is very light, and the people wealthy; food is cheap, and the labourers are all in the service and at the command of a body of comparatively large holders of land.

In Madura;

388. In Madura the improvements commenced about 15 years ago. The contribution by Government to the work has averaged about *Rs.* 10,300 annually during that period; and the district also received *Rs.* 20,000 from the accumulated Surplus Pagoda Funds, when they were distributed in 1847. What the annual aid from that source was before, we have not the means of knowing: it was certainly much less than in Tanjore, probably a few thousands annually. A large part of the Madura Collectorate is similar in the character of its surface to Tanjore: in other parts, there is more inequality of surface, but with an improved soil for roads. The result of 15 years' labour in Madura is that the district, which contains 10,700 square miles, possesses nominally 683 miles of made road; but only a small part of this extent has ever been made in reality, and a large proportion of the so-called making consists in merely mending the most impassable parts. A very small extent is even gravelled, and all the gravelling that has been done has been out of the sums granted by the Government.

In Salem.

389. But Salem is the district which is generally regarded as the model district with respect to roads, and which is certainly better off than any other, and it is there that the employment of unpaid labour has been pushed the furthest. Mr. Orr went to the district, as Principal Collector, in 1829: he very shortly commenced his endeavours to improve the roads, and it was he who introduced the existing system, and worked it with much vigour during the eight years that he administered the district. The contribution to the roads, by Government, from 1830 to 1850, has averaged *Rs.* 7,783 yearly, and the produce of the cart-tax also applied to the same object has averaged *Rs.* 1,907 a year since its imposition in 1836. Throughout the whole Madras Presidency, there is no district possessing a soil so favourable for roads as Salem: it is almost every where a hard gravel, and in many parts nothing more is required to make a road good enough for light traffic, than to provide for the drainage; and here also, as in both Tanjore and Madura, the rate of the assessment is light. Here, then, the system has had a fair trial: it has been worked with energy, and over a sufficiently long period, to show decided results; and it may truly be said that it has here done all that it is capable of. And what then are the results? why, that this extensive district of above 8,000 square miles, has 400 miles of road suitable to a light traffic, infinitely superior to the common roads of other districts, but very inferior to first-class roads; and the extent of road made is utterly unequal to the wants of the district, and leaves a very large part of it at a great distance from anything like a road.

The real character of the system.

390. And it is important that the real character of the voluntary system, as it is called, should be known. The labour employed on the roads is commonly termed "voluntary labour;" but in reality it is voluntary only in the sense in which convict labour is so, being given under duress or compulsion, and accordingly Mr. Blackburne, the Principal Collector of Madura, justly styled it "forced labour." When the roads in Salem were first made, the work was done throughout all the most thinly inhabited tracts, under the direction of the lowest paid and most unscrupulous class of Government functionaries, the common Talook peons on from six to eight shillings a month, who were vested with very wide powers for the purpose. Men of this class were employed to collect the labourers; to take them, in some cases, two days' journey or more to the road, and prevent them from leaving the place till the work was done. As a matter of course, the power entrusted to these men was abused, and made a means of benefiting themselves; and exemption from work was obtained by such means as were necessary, at the cost of those who were too poor to bribe, too weak to resist, or too dull to escape. In countries like Tanjore, where the population is more dense, the abuses are likely to be less aggravated; but where the demand of gratuitous labour is once sanctioned by the responsible officers of Government, there is no saying how far it may be carried, or what abuses it may engender, unless placed under the most rigid restrictions.

And as the exaction of the labour is oppressive, so its employment is wasteful; the usual Superintendents are the Talook Peons above described, who have no knowledge whatever how the work ought to be done; and thus in useless work and bad material a great part of the labour expended is absolutely thrown away.

The result would be still worse in other districts.

391. Such have been the results of the unpaid system in the three districts of which we have now been speaking, which were certainly (especially Salem) eminently favourable for the trial, and though a large amount of aid has been given by the Government, large compared with what has been granted in most districts. And so little having been effected there, it may well be judged how utterly incapable the system is of producing any considerable results in other districts, such as Bellary and Cuddapah, Coimbatore, North and South Arcot, and the Northern Districts; in all of which instances the population is more scattered, the soil much less adapted to road-making, the surface of the country more rugged, and the pressure of the land assessment heavier. The forced labour system could not be introduced under such circumstances to any material extent, without an exertion of arbitrary power such as we are sure the Government would shrink from; and even if it could be enforced, the example of Salem, and the very meagre results obtained there after 22 years of effort, is sufficient to show how complete would be its failure as respects the important object in view, viz., that of providing a general and efficient system of cheap conveyance.

Conclusion on the question.

We return to the proposition with which we set out. The village communities may properly be charged with the duty of making and maintaining the village roads,

roads, viz. those to connect outlying villages with the main lines; but the latter, that is, the main arteries, both general and local, both of the whole country and of the district, must be made and maintained by the Government. And we feel no doubt that if this latter duty is duly performed, and the people are thus enabled to see the direct benefit to themselves from completing the system, their part also will be readily performed; that the village communities themselves will for the most part co-operate in enforcing the obligation, and that the aid required from the officers of Government will be chiefly to direct and instruct, to which an efficient department will be fully competent.

The surplus ferry receipts have been withheld by the Government.

392. We may here advert to the unfortunate denial by the Government of one valuable means of local improvement, viz. the surplus receipts at the Government ferries. We have already alluded to the order of the Honourable Court conceding the income from this source as a fund for the local improvement of the roads; that order was given so long ago as 1817, and its tenor was as follows: "The tolls which are collected at ferries, and which in some districts are brought to account as an article of revenue, should be set apart as a fund for providing ferry boats, and building bridges over rivers and nullahs; and in the event of the tolls yielding more than what may be sufficient for these accommodations, the surplus may be appropriated to the repair of the public highways in those districts." This has never been done; the Government, for whatever reason, intercepted the bounty of the Court of Directors, and the proceeds of the ferries have been uniformly swept into the Treasury as a part of the general revenue.

We obtained from the Board of Revenue a statement of the ferry collections in each district during the last five years, from which it appears that they are inconsiderable in all the districts except the following, viz. South Arcot, Bellary, Coimbatore, Canara and Malabar. In the first mentioned four they range from *Rs.* 3,000 to *Rs.* 6,000 a year; but in Malabar the average collections much exceed *Rs.* 35,000 a year. We have no account of the cost of maintaining the ferries in any of these districts except Malabar, for which we obtained from the Collector a statement of the receipts, charges and surplus for 20 years. From this document we find that the whole receipts from the ferries during this period amounted to *Rs.* 7,02,416; and after deducting all charges, including the payment of half the receipts at the Mahè River to the French authorities, the net amount was *Rs.* 6,84,161, which was carried to the credit of Government as an item of revenue.

This has been an injury to the districts concerned.

393. It may perhaps be urged, that though the Government has not set apart these receipts as a special fund for improvements, yet that it has made commensurate improvement out of the general revenue; but this is not the case as regards Malabar. A reference to Appendix (W.) will show that the whole outlay by Government on roads, bridges and ghauts in that district during the last 20 years was only *Rs.* 3,11,664, being considerably less than half the amount of the net surplus ferry funds as above specified; and this amount of Government expenditure includes the cost of some roads constructed less for the benefit of Malabar than for other districts beyond, as the road from Ponnany to Coimbatore. Had the ferry funds of the district been fairly expended, according to the liberal intention of the Honourable Court, the rivers would long ago have been bridged, and the toll might either have been abolished, or, for the sake of continuing so valuable a source of improvement, it might have been levied at a lower rate upon the bridges, and the internal communications of the district, now in the wretched condition above described, might have been very greatly improved.

And even as respects the other districts, where the surplus funds are smaller, it is no sufficient excuse to say that the Government expenditures on the roads have on the whole exceeded them in amount. Those funds were granted for local purposes, and might fairly be claimed independently of the Government grants. And the value of such a fund at the disposal of the local authorities, without the tedious intervention of applications to Government, correspondence, explanations and sanctions, would be far greater than its mere amount indicates. Independently of the advantage of effecting an improvement at once, instead of after two years' trouble and delay, such a fund would often be made the means of calling out the liberality of the people. In Bengal and in the North West Provinces, the ferry funds to a very much larger amount than under this Presidency, are thus given up for local improvements, under the direction of local authorities, and we believe with excellent effect. We beg to recommend that now, at last, the same course may be adopted here also; and we suppose that the sanction of the home authorities to this

this step having been given long ago, all that is now required is the order of this Government.

The income from the Cochrane Canal also should be given up for local improvements.

394. And the receipts from the Cochrane Canal, though called by a different name, appear to us to be of the same nature as these ferry funds, and proper to be treated in the same way. The net income from that canal amounts to very nearly *Rs.* 30,000 a year, and very little indeed has been done to improve the navigation.

It seems to us utterly unworthy of a great Government to make such a work a source of revenue; it would surely be wiser, as well as more becoming, to devote the proceeds to the improvement and extension of so valuable a means of transport. Deducting the amount paid by Government for the canal (*Rs.* 1,44,893), the aggregate of the net receipt since the purchase in 1836, is *Rs.* 2,22,915. Had this sum been steadily expended on improvements, instead of being absorbed in the Government Treasury, we should now have a canal navigation of 150 miles instead of only 50 miles, and that in a much higher state of efficiency than the present imperfect work.

We may add here, that the Cochrane Canal appeared to us so important as the first attempt made under this Presidency to introduce canal navigation, and with eminent success, that we were led to investigate the past and present condition of the work with some minuteness. The result of these inquiries was embodied in a paper which will be found in Appendix (I I.).

The social value of roads exemplified.

395. The very important and certain truth, that improved and cheapened means of transporting produce do conduce in an enormous degree to the advancement of the wealth and prosperity of a people, is so generally admitted, that it would seem superfluous to go about to prove it. But we cannot forbear to quote a few short passages from a well-known and valuable statistical work, tracing the vast transformation effected within a very limited time by a small piece of road, in a wild district in Ireland, a country much more nearly than England resembling India in its connexion with this subject. The former state of the tract is first described as follows, in 1822: "The fertile plains of Limerick, Cork and Kerry are separated from each other by a deserted country, hitherto nearly an impassable barrier. This large district comprehends upwards of 900 square miles; in many places it is very populous. As might be expected under such circumstances, the people are turbulent, and their houses being inaccessible for want of roads, it is not surprising that, during the disturbances of 1821 and 1822, this district was the asylum for whiteboys, smugglers and robbers, and that stolen cattle were drawn into it as to a safe and impenetrable retreat. Notwithstanding its present desolate state, this country contains within itself the seeds of future improvement and industry."

In 1824, only two years later, it is thus mentioned:—"A few years ago there was hardly a plough, car or carriage of any kind; butter, the only produce, was carried to Cork on horseback; there was not one decent public-house, and only one house slated and plastered in the village; the nearest post-office 30 miles distant. Since the new road was made, there have been built upwards of 20 respectable two-storey houses, a shop with cloth, hardware and groceries; a comfortable inn, a post-office, bridewell, new chapel, a quay covered with limestone for manure, a salt-work, two stores for oats, and a considerable traffic in linen and yarn." This gratifying statement describes only the first beginning of improvement. When seven more years had passed, the population amounted to more than 1,100; in 1841, they exceeded 1,500 souls. The 20 houses spoken of were increased to more than 250, forming the flourishing town of Cahirciveen, which is the centre of a considerable import and export trade. These advantages, which are still only beginning to develope themselves, have originated in the making of about 70 miles of new road, on a level line."

The following passage, extracted in the same work from the Reports of the Irish Commissioners of Public Works, describes the improvements in this tract in common with other similar tracts: "These roads have been the means of fertilizing the deserts, and of depriving the lawless disturbers of the public peace of their place of refuge, affording them at the same time resources for an active, honest industry, of which we must do them the justice to observe, they have not shown any indisposition to avail themselves.

"In traversing a country covered with farms, and in a high state of cultivation, showing every sign of a good soil, and of amply remunerating produce, it becomes difficult to credit the fact that 10 or 12 years since the whole was a barren waste, the asylum of a miserable and lawless peasantry, were calculated to be a burthen rather

rather than a benefit to the nation; and that this improvement may entirely be attributed to the expenditure of a few thousand pounds in carrying a good road of communication through the district." Porter's Progress of the Nation, Edition of 1851; pages 294, 295.

There is no room for doubt, that the same measures would produce the same effects in this country also; there are tens of thousands of square miles here, in a state similar to that of the district described in the first of these extracts in 1822, except in having a less turbulent and more industrious population; and it is a moral certainty, that similar improvement, moral and economical, would follow the use of the same means. Government alone can put those means in operation; and setting aside entirely the consideration of profit, it is a serious question what amount of responsibility the Government incurs in so long continuing to neglect to do so.

The direct and powerful tendency of improvement in the roads to augment the revenue.

396. But we would now go on to observe how directly in this country such improvements must operate on the Government revenue. For their immediate and direct effect is to give an increased value to the produce of land, and to bring purchasers into the market; and this again conduces no less infallibly to the extended cultivation of land, and every fresh acre brought under the plough adds to the revenue. We have already observed how desirable it is that some other species of crop should be found than grain, such as would always ensure a demand in a foreign market; and there is no way of effecting this so sure as that of improving the roads, and thus giving a value to produce which is now worthless, because it will not bear the cost of carriage to a market. This intimate connexion between improved transit and the Government revenue exists here in a far higher degree than in the North West Provinces; for here, under an annual field settlement, extension of cultivation gives a direct and immediate addition to the revenue; while under the Agra Government the revenue is for the most part settled for 30 years and incapable of increase during that period; yet, in spite of this difference, an activity in road improvement is in operation there which is wholly unknown here. Indeed the Government here, in its character of landlord, is much more nearly interested in the improvement of the means of communication than even the landlords in England. For there, in general, every acre already pays rent, and the rent of an estate can only be gradually raised; but here there are millions of fertile acres unreclaimed and waste, and only waiting for something to give a value to the produce which they are capable of yielding, to become productive and pay revenue; while abundance of labour, anxious for employment and finding none, from the same cause, remains idle and starving, or emigrates to other countries. Here good roads would at once effect a transformation, by making it worth while to employ the labour on the land; and thus both would become productive and valuable, instead of useless and even mischievous.

The actual state of the roads directly impedes improvement.

397. We have already had occasion to point out (*supra*, paras 248 and 249), how the improved means of irrigation in South Arcot district have been in a great degree rendered unproductive by the want of roads; and it cannot be doubted that their entire absence in Bellary and Cuddapah, as well as in the Northern districts, must have operated enormously to keep down improvement. There is not a district throughout this Presidency which does not yield a variety of products having a value in other markets, either in this country or abroad; and the demand for such articles, and with it their production, would be enormously increased if they could be brought to market at a moderate cost for conveyance. But the cost of carriage eats up all the profit; indeed on many commodities it amounts to what would constitute a handsome mercantile profit several times over. Thus the cost of clean cotton at Bellary, is about 1 anna 1 pie per lb.; the cost of conveyance to the Presidency for shipment, even on carts, is *Rs.* 25 for 2½ candies, or 1,250 lb., being at the rate of 3·84 pice per lb., which is within a small fraction of 30 per cent. on the price of the article. There is no doubt that the cost of carriage would be reduced by a good road to one-third of what it now is, for this is no more than has been done already on the Western Trunk Road, imperfect as it is; and it is self-evident how large would then become the inducement to the growth and export of this commodity. In the actual state of the roads throughout the two vast districts of Bellary and Cuddapah, and those connecting them with the coast, it is matter of astonishment that any article of raw produce can be brought to Madras at all at a paying price; and the fact that large quantities of cotton are exported from those districts in spite of those obstacles (a large part of it being still carried on pack bullocks),

bullocks), opens the most encouraging prospect if only the communications are improved.

Actual gain to Government by the road improvements in Canara:

398. But the proof of the position that road improvements powerfully affect the Government revenue does not rest merely on general argument; actual results can be pointed to, of large improvement in the revenue immediately connected with the formation of roads, and very large when compared with the scale of the operations. We refer to the district of Canara, where during the last 16 years several passes have been opened to connect the coast with the country above the ghauts, and with marked benefit in every respect. Prior to 1836, as we learn from the Collector (Appendix K.), little had been done to improve the roads and passes, and the district was in much the same state in this respect as other districts; but in that year a beginning was made, and ever since a steady course of improvement has been going on. And almost all the measures adopted have consisted in forming communications between the coast and the interior, by opening passes through the mountain range called the Western Ghauts. The total expenditure on these roads and passes, from 1836 to 1850 inclusive, is stated by the Collector (Appendix K.) at *Rs.* 5,25,000.* The Collector quotes various proofs of the consequent advancement of the district in prosperity; but we will here notice only the revenue from the land and from salt.

n the land revenue.

399. We find (Appendix K.) that the land revenue, which, on the average of the five years ending 1802–03, amounted to *Rs.* 16,90,705, was *Rs.* 17,10,621 on the average of the five ending with 1836–37, showing the insignificant increase of less than $1\frac{1}{2}$ per cent. in 35 years. While during the subsequent period, throughout which, as already said, the improvement of the communications was systematically pursued, the revenue of each year, with one exception, exceeded that of the preceding year, until in 1850–51 (Fusly 1260), it amounted to *Rs.* 18,14,678, being above six per cent. increase in 15 years. The Collector does not give us the details of the revenue of the years during this period, but we have obtained them from the Board of Revenue, and give them in the margin.† It is there seen, that on the whole the increase in the 15 years amounts to *Rs.* 16,39,575.‡ Mr. Maltby enumerates several causes which have contributed to the advancement of Canara, but he ascribes the greater part of this gratifying state of things to the opening of the communication with the interior; and he expressly declares his opinion, that "the roads have paid for themselves." Such truly appears to be the case. Supposing even as much as one-half of the aggregate increase in the land revenue to be due to causes unconnected with the road improvements, the remainder *Rs.* 8,19,787 is 50 per cent. more than the expenditure on those improvements during the whole period. And this is from the land revenue only; there has also been a very large increase in the revenue from salt during the same time; and to this we must next advert.

Fusly.	Land Revenue.
	Rs.
1241	16,18,817
1242	16,16,731
1243	16,73,650
1244	16,88,980
1245	17,05,931
1246	17,15,917
1247	17,28,823
1248	17,32,820
1249	17,44,029
1250	17,54,760
1251	17,62,831
1252	17,65,883
1253	17,72,127
1254	17,77,811
1255	17,80,090
1256	17,85,313
1257	17,93,733
1258	18,03,681
1259	18,13,618
1260	18,20,466

The salt revenue.

400. The salt revenue at this Presidency is levied by means of a monopoly. The salt is made by a simple process in the open air; the water of the sea is let into square beds, the ground having previously been prepared and levelled, and the heat of the sun evaporates the water, and leaves the salt. These "Pans," as they are called, are private property, like cultivated land, but they can only be used under regulation; the Government officers fix the quantity of salt to be made by each owner, and all the salt that is made is required to be delivered at the Government salt store. A price is paid for it to the makers, varying from about *Rs.* 7 a garce to *Rs.* 15 at the several stations; and it is sold to the public by officers of the Government at *Rs.* 120 a garce. The quantity allowed to be made every year at

* This amount differs from that shown in Appendix (W.), obtained from the Board of Revenue, because the latter is framed from the bills passed in each year. These bills are never passed till a considerable time after the work was completed, and a statement compiled from them, therefore, can never correctly represent the expenditure of each year.

† The marginal statement, like those given by the Collector, excludes the Coorg Talooks, which were added to the district in 1835. A slight discrepancy will be observed between the Board's figures and the Collector's; in the former the actual collections are given, as they constitute the actual revenue; the Collector may possibly have given the amount of the settlement of each year.

‡ In the letter already referred to, Appendix (K.), Mr. Maltby gives the extension of cultivation in three talooks, being the only ones in the district in which the details of cultivation are officially recorded. It shows a total increase of 16 ½ per cent. in 12 years, which is expressly declared to be the result of steadily progressive improvement, not of accidental circumstances of season.

at each station is fixed with reference to the expected sales, and with the object of having always a quantity on hand, so as to meet a sudden increase of demand.

The selling price at the several stations on the coast is invariable, not varying, that is, with any incidents of the season or manufacture; but in the interior, of course, the cost of carriage forms an important element in the price of so bulky a commodity; everything, therefore, which tends to reduce the cost of conveyance lowers the price of this necessary of life in the inland districts, and so increases the consumption of it; and all improvement of the roads between the coast and the interior acts powerfully in this way.

Increase in the salt revenue in Canara.

401. With these few preliminary remarks we beg to request attention to Appendix (C C.), being a statement of the quantity of salt sold for home and inland consumption in each of the 15 coast districts, in the 20 revenue years, 1831-32 to 1850-51. On looking at the sales of salt in Canara, in that statement, it will be seen that they exhibit not only a rate of increase unknown elsewhere, but a steadiness of progress also, which contrasts with the fluctuations seen in other districts. Not only do the average annual sales of each five years of the period exceed that of the preceding five, but, with few exceptions, there is an increase in the sales of every succeeding year. On the whole, the average yearly sales of the last of the four periods exceed those of the first by no less than 50½ per cent. Mr. Maltby declares his opinion, as already observed, that, among various causes for this increase which he notices, the formation of the passes is the chief, and it clearly appears to be so. No doubt the abolition of the transit duties in 1843 conduced in a great degree to the same end by benefiting trade generally; but against this has to be set off an addition of 12½ per cent. to the monopoly price of salt, which took place at the same time, and which operated seriously to limit consumption, as is seen in the falling off in the sales in that year in this and every other district.

Total results in that district.

402. The total gain in the district in this source of revenue in the 15 years 1836-37 to 1850-51, above the average of the five years, 1830-35, amounts to no less a sum than *Rs.* 15,60,488; and deducting here also even as much as one-half of this, as due to other causes, there remains the sum of *Rs.* 7,80,244, being half as much again as the whole cost of the road improvements; so that in the short period that has elapsed since the roads were opened, or, more properly, even while the works have been in progress, their whole cost has been repaid to Government once and a half times over in the single item of salt revenue; and, adding the increase in the land revenue, already described as due to the same cause, viz. *Rs.* 8,19,787, the whole outlay has already been replaced more than three times over.

Or, to put it in another aspect, taking the whole cost of these roads as capital, the annual interest on it at 5 per cent. amounts to *Rs.* 26,250; and if to this is added the charge for repairs and superintendence at 5 per cent., the whole annual cost of the roads is *Rs.* 52,500. But, taking the average of the last five years, the yearly increase in the land revenue ascribable to the road improvement is *Rs.* 54,386, and in the salt revenue it is *Rs.* 52,016, after deducting one-half in each case; so that in this district the Government has received a direct net return on the capital expended of 10¼ per cent. in the form of land revenue, and 10 per cent. in the form of salt revenue, being a total net profit of above 20 per cent. on the outlay, clear of all charges.

Comparison of Canara with Ganjam and Vizagapatam.

403. But the effect of the improvements in Canara on the consumption of salt, will be best seen by contrasting the state of the salt revenue there with what it is in another part of this Presidency, very similar to that in its geographical position; we allude to the two districts of Ganjam and Vizagapatam, which, like Canara, stretch along the sea-coast, on a narrow strip of low country backed by mountain ranges, but which differ from that district in being entirely cut off from access through the hills to the level country beyond. These districts, like Canara, manufacture salt, and might make an almost unlimited quantity, but, in the absence of access into and through the hills, the demand appears to be limited to the consumption of the coast tract itself. These districts participated equally with Canara in the abolition of the transit duties; but here that boon failed even to countervail the depressing effect of the cotemporaneous increase in the selling price of salt. A reference to Appendix (C C.) shows that, compared with the first period of the series of years there exhibited, there is a positive falling off in the last period in

the quantity of salt sold in Ganjam; and that, though there is a slight increase in Vizagapatam, yet the decrease on the two together amounts to very nearly 5 per cent.; and yet it needs only a glance at the map to perceive that the sales of salt in these districts would far exceed those of Canara, if proper roads were opened. Canara, it is true, is backed by the Mysore country, and supplies that country with salt and other articles in exchange for its inland products; but passes through the mountains behind the northern districts would put them in immediate communication with the vast territory of Nagpore, a country producing all the inland products, and especially abundance of excellent cotton, and where sea salt is a rarer luxury than even in our own district of Bellary. Passable communications between the two countries would give value to the peculiar products of both, and the people of both would be vastly benefited, while the example of Canara justifies the undoubting conviction that the cost to Government would be abundantly repaid in augmented revenue. The increase might not indeed be so great, because the good internal communications of Mysore are wanting in Nagpore; but they might be very much less, and still abundantly repay the cost. We have already adverted to the pressing necessity for roads through these mountains for political and military purposes, and to the fearful expenditure of life and treasure which the want of them has occasioned; to those considerations we have now to add the large gain to the revenue to be secured by their formation.

The Western Trunk Road and the salt revenue of the Madras Collectorate.

404. No other district displays the advantages of improved roads in the same degree as Canara, not only because the improvements there have been on so much larger a scale than anywhere else, but also because they have been exactly of the most effective kind, viz., the opening of roads from the coast to the interior, and because these roads are so arranged that in a greater or less degree they affect the whole district. Salem is entirely an inland district, and is still cut off from direct approach to the coast, except from one extremity by the Western Trunk Road; and Tanjore is on the coast, and is equally without access to the inland countries beyond. The Western Trunk Road runs from the coast to the interior; but it is a single line, passing through portions of several districts, and being without branch roads, its effect is limited to those parts contiguous to it; and it cannot be supposed capable of so powerfully affecting those portions, as to exhibit any very marked influence on the revenue of the whole districts. There is one branch of revenue, however, which it is well calculated to affect; viz. the sales of salt at Madras; and we will examine the results there.

Prior to 1847, the manufacture of salt at Madras was confined, under the orders of the Board of Revenue, to the supply of its own population, and the providing a small quantity for export to Calcutta; the issue of Rowannahs for the interior was prohibited. But in January of that year, on the representation of the Collector that there was little demand for the Calcutta market, and that the facilities for inland sale were very great at Madras, the prohibition was withdrawn. This measure opened the Western Trunk Road to the dealers in salt; and was precisely equivalent to making a good road to the salt stores, in lieu of the wretched tracks by which alone the stores before available for the inland supply can be reached. The effect has been most satisfactory; the sales have greatly increased, and are still increasing.

Table of the sales before and after the road was opened.

405. In order to get a fair view of the results, we must take the sales of the Chingleput district, as well as those of Madras; both because a considerable part of the salt sold at the store of the latter Collectorate was drawn from the neighbouring pans of Chingleput, its own being unable fully to supply the demand, and also because the sales at other stations in Chingleput have been in some degree diminished. We take these sales in the five revenue years preceding the change of system, and the five succeeding it, which are shown in the following Table:

Fuslies.	MADRAS.		CHINGLEPUT.		TOTAL.	
	Quantity.	Price.	Quantity.	Price.	Quantity.	Price.
	Garce.	*Rupees.*	*Garce.*	*Rupees.*	*Garce.*	*Rupees.*
1841-42 - -	893	93,794	3,702	3,87,613	4,595	4,81,407
1842-43 - -	928	97,467	3,096	3,24,109	4,024	4,21,576
1843-44 - -	1,016	1,26,733	3,476	3,74,503	4,492	5,01,236
1844-45 - -	984	1,22,082	3,257	4,00,154	4,241	5,22,236
1845-46 - -	866	1,03,926	3,828	4,59,388	4,694	5,63,314
Average - -	937	1,08,800	3,472	3,89,153	4,409	4,97,953
1846-47 - -	2,196	2,62,283	3,316	3,97,942	5,512	6,60,225
1847-48 - -	2,280	2,73,600	2,982	3,57,892	5,262	6,31,492
1848-49 - -	3,131	3,74,860	1,942	2,33,129	5,073	6,07,989
1849-50 - -	3,353	4,02,305	2,539	3,04,691	5,892	7,06,996
1850-51 - -	4,156	4,98,711	2,091	2,50,471	6,247	7,49,182
Average - -	3,023	3,62,352	2,574	3,08,825	5,597	6,71,177

Note.—Half of Fusly 1256 was under the restricted system; the change was made in the beginning of January 1847, and that Fusly ended on the 11th July 1847.

406. From this statement it is seen that the average quantity of salt sold in the two districts in each year of the latter period, exceeded by 1,188 garce the average of the preceding period, notwithstanding the increase in the monopoly price in Fusly 1254. The total increase in the quantity sold in the five years was 5,590 garce, and the price of this quantity at *Rs.* 120, the present rate, is *Rs.* 7,22,800; this then is the amount of the gain to the salt revenue, in spite of the effect of the higher price in limiting consumption, and excluding from the calculation the gain by that higher price. Now, to compare this gain with the cost of the Western Trunk Road; we have already stated that up to the beginning of 1845, ten and a half lacs of rupees had been spent on the road, and the subsequent expenditure to the end of 1851 amounts to *Rs.* 3,73,000, making a total of *Rs.* 14,23,000. The sum stated to be necessary for keeping the road in its present state of repair, is something under *Rs.* 40,000 yearly; the cost of maintaining the road for the 10 years since it was completed, will thus be *Rs.* 4,00,000, and the cost of formation *Rs.* 10,23,000. Thus the whole annual cost of the road may be computed at *Rs.* 91,150, being the charge for maintenance added to interest on the first cost at 5 per cent. But the annual gain in the increased sales of salt has been *Rs.* 1,42,260; being above half a lac in excess of the yearly cost of the road. Thus in this case again, notwithstanding the heavy cost of this road, both from the nature of the country crossed and the quantity of drainage to be provided for, and from the distance of material (all owing to a faulty selection of the line), the charge has been much more than repaid to Government by increased revenue from the single article of salt. Nothing could more vividly illustrate the value of roads into the interior, or more emphatically enforce the necessity of opening such communications.

The increase has much more than paid the cost of the road.

407. Having thus endeavoured to show the great neglect of the communications on the part of Government in time past, their consequent extremely bad condition at present, the urgent necessity of improved roads to develope the resources of our territory, and the great gain to be obtained by the Government itself by a liberal course of expenditure on this object, we will now give an outline of that system of internal communication which seems the best adapted to bring out and unfold the productive powers of the country.

Outline of a general system of roads.

The great lines for trade will be those from the coast to the interior; the cause being mainly that by far the best and the largest markets for produce are the shipping ports, and in a minor degree that the products of the coast and of the interior respectively differ and afford variety for interchange, while those of the districts north and south, whether on the coast or inland, are similar. No doubt the capital collected in the larger seaports, the greater convenience of some ports and the form of the country, will all operate to modify the application of this rule; but the raw produce of the country generally being of such low value that every

The great commercial lines will be east and west.

every addition of transit is of consequence, the main object to be kept in view must be to effect the most direct communication with the shipping port.

In Canara this principle was kept in view in designing the new roads; all of which run direct from the coast to the Ghauts, except the Sumpajee, which having another object besides the facilitating of trade, viz., the political one of opening what was then a disturbed part of the country, goes in an oblique line from Mangalore to Mercara. As a consequence, it has been comparatively little used as a trading line; and a new line has therefore been opened, from the foot of the pass direct to the sea at Cossergode, the effect of which is observable in a traffic which otherwise would have made no use of the pass.

And there must be coast lines and connecting lines north and south in the interior.

408. Lines running north and south are of little value for trade, except where there are great markets to be reached, as on both coasts. One great object to be kept in view in sketching out a general system of communication is to provide for the cheap transport of grain in cases of scarcity, from parts of the country where it is abundant to those where it is deficient. On the western coast indeed this is of minor importance, for the south west monsoon which fertilizes those districts never fails; but on the eastern side of the Peninsula it is a matter of the first consequence. On that coast we have several extensive tracts watered artificially by means of the same unfailing south west monsoon, but they are separated by long spaces wherein the crops are almost entirely dependent on the local rains. North and south lines are here required therefore to equalize the supply of food; and they will be supplied by canals parallel to the coast, which can be formed with wonderful cheapness. Besides these lines there must be some in the interior running both north and south and obliquely, to connect military stations and important places for military purposes, and to open the country for general intercommunication; and branch roads will be required to connect these main lines with considerable towns and cross lines throughout the country.

The skeleton, or main lines of the system of communication which we have to propose, will therefore consist of, 1st, a number of lines running from the coast towards the central parts of the Peninsula, reaching to the centre if it be in our own territory, and meeting there the lines from the opposite coast, or stopping short at our own frontier, where the central parts belong to independent powers; 2d, lines of communication, for the most part canals, running along both coasts; and 3d, a system of roads in the interior, connecting principal places. And on these arterial lines the medium of communication should be first class roads, canals or railways, according to circumstances; and in the last case at least, they may properly be prolonged by convention, even into the territory of independent powers.

Number of east and west lines required.

409. As respects the number of east and west lines, we may take as an example what has been already done in Canara, and which has been proved by actual experiment to be not at all more than is sufficient. The length of the district of Canara, along the coast, is about 220 miles, and it now contains six passes into the interior, fit for cart traffic, though still requiring much improvement; thus there is on an average one road into the interior to every 35 miles of coast; and not only are these roads fully used, but more are represented to be still wanting; in one of his letters to us, Mr. Maltby writes as follows: "The great wants of Canara are at present ghauts, roads, bridges, &c." Most emphatically may this be asserted of the country at large; but here we find it maintained, and on the best authority, of that district which already has very far more of such aids to wealth and civilization than any other, and the present condition of which in this respect we now propose as a standard to be attained in other districts; we feel confident therefore, that in doing this, we are very much understating the real wants of other districts, and that more roads will eventually be required than we now propose; but even thus much will be a very great boon and blessing to the country.

The length of the eastern coast of the peninsula in this Presidency, from the frontier of Cuttack to Cape Comorin is about 1,000 miles, and the length of the collectorate of Malabar, on the western coast, is 140 miles; making a total of 1,140 miles. According to the proportion already existing in Canara, this length of coast would require 33 roads into the interior; but there are already three roads in Malabar, while on the whole of the east coast there are not more than two roads that can be considered as made, or as in a fit state for carts; this leaves 28 such lines to be still opened.

410. The

410. The length of these lines will vary widely. In the north, that is from Ganjam to Guntoor, they will not exceed from 50 to 100 miles in a straight line from the sea, that being the width of the British territories there. In the ceded districts, Bellary and Cuddapah, they will be about 200 miles in length, from each coast to the centre of the Peninsula. South of Madras they will be 120 to 150 miles; and farther south still, where the Peninsula narrows, they will be even shorter. An average of 150 miles may be taken, and this for 28 roads, will give a total length of 4,200 miles. Their length.

The lines parallel to the coast will be 1,500 miles, of which at least 1,200 should be navigation by canal and backwater. The inland main lines may be taken at 2,000 miles; thus making a total of 7,700 miles. The other lines.

Of the probable cost of these lines, and of the time within which we may contemplate their formation, we shall speak in the next section. We will here only add, that for the purpose of opening a communication with the interior of the country, there is at least one of the large rivers which may be made eminently serviceable; we allude to the Godavery; this noble stream flows a course of 700 miles, and its main tributary, the Wurdah, passes through the extensive cotton districts of Nagpore. This line, viz., that of the Wurdah and the Godavery, has been actually navigated for above 400 miles from the sea, and a trifling outlay would remove some difficulties in the course, and very much facilitate the navigation. A proposal, with this object, made by the Civil Engineer of the division, and supported by the Commissioner and the Collector, came before the Government last year; but the small sum of *Rs.* 10,000 (1,000 *l.*) required, was refused by the Bengal Government. Were the river opened, the great cotton marts of Oomarawutty and Chandah would be at once placed in immediate communication with the manufacturers of Lancashire; and not this only, it would at once open the whole market of those extensive regions to the rice of the Godavery Delta, and to the salt of the coast. The vastness of the transformation which would follow the opening of that great river to navigation, cannot be adequately conceived; it is no exaggeration to say, that the rapid growth of Liverpool and New York are only examples of what would ensue.* The Godavery river navigation.

411. It may seem startling to some, that we should represent so many passes into the interior to be necessary; but we are fully borne out in the statement by the example of Canara; and still the number in that Province is not sufficient; the inhabitants petition for more, and the Collector, Mr. Maltby, supports the demand, and his recommendation is quite enough to guarantee its justice. In 1842, it was found that there were 25 passes by which trade was carried on upon bullocks; grain and other inland produce being brought down, and salt and salt-fish, cocoanuts, &c. being carried up. Since the passes were opened the trade has expanded immensely, and it is no wonder that the six passes now open for wheel conveyances are found insufficient to supply the place of the 25 passes formerly in use. The number of passes proposed is not larger than necessary.

Nor can any reason be shown why a similar trade should not spring up on the east coast. Not to mention our own Provinces, and especially the ceded districts, Bellary and Cuddapah, heretofore the most cut off of all, the Nagpore country and the Nizam's dominions are not less productive than Mysore, while in area they vastly exceed it.

412. In concluding for the present our remarks on this subject, we would observe that the existing classification of the roads must be abandoned as unsuitable, and liable to mislead. At present, certain roads, arbitrarily selected, are called trunk roads, and are looked on as the first class; while all others are styled branch or cross roads, and if attended to at all, are regarded as only deserving very inferior treatment. Many of the lines called trunk lines, are however by no means of the first importance; while many that are naturally the great arteries of trade have been quite neglected under the general term of branch roads. There are many lines, like that from Madura through Dindigul by the Paulghaut gap to the western coast, along which, though entirely overlooked, an important trade has been struggling for years, in spite of rocks, rivers, swamps and jungles; and which, when once observed, are seen to be great trading lines. And besides existing roads at least practicable, there are foot-tracks such as the Neelcoond pass was a few years The present classification of roads must be abandoned.

* *See* below, Paras 433, &c., and Appendix (K K.)

years ago, which when opened to cart traffic, will, like that, in a few years, raise a seaport town on the bare beach; and lastly, there are other lines on which no path now exists, passable even to the foot-passenger; but which if opened, bridged and made practicable for carts the whole year through, would speedily exhibit a traffic equal to that of any existing road. Such would be the case undoubtedly with many lines in the northern districts leading into the Nagpore country. To estimate the value of a line by the traffic on it, when it is in such a state as to throw every possible impediment in the way of traffic, is contrary to reason; yet such was the ground on which bridges were refused to the road from Berhampore to Russelcondah. The way to ascertain the really most important lines is by careful local inquiry, aided by the study of the map; and if the present classification is tested in this way, it will be found that we are treating some of the most important lines as if they were of no more use than to join neighbouring villages.

The question how far it is worth while to make good roads in this country.

413. We have still to consider another question in connexion with the roads. An opinion was broached by the late Superintendent, that instead of attempting to make good roads in this country, it would be much better to lay out the money in making "practicable" for carts the existing tracks, by an outlay of *Rs.* 100 a mile, thus getting a large extent of bad road, instead of a small extent of good; and Captain Best even contended that metalling the surface was absolutely prejudicial to a road, unless it was done in perfect style. The Government cordially adopted these ideas, to the extent at least of lowering the quality of road to be aimed at; and a report of Captain Best's in which he set forth his views on this subject was thought so valuable, that it was printed and circulated to all officers both of the Collectors' and the Civil Engineers' Departments, together with some remarks upon it by the Government. We, on the other hand, earnestly advocate the construction of really good roads; and it is proper that we should give our reasons for recommending that course, as the wisest and the most profitable.

The order of Government quoted.

414. The remarks of Government on the report of Captain Best, above referred to, are as follows: "Captain Best was of opinion, that the utility of the expenditure in patching up a bad road has been very far less than, perhaps not one half, what it would have been, had a larger outlay been made when it was wanted. The advantage of metalling a road, he observed, depends in a remarkably high degree upon its being not only in tolerable, but in perfect order." The conclusion he had come to, after giving the most anxious consideration to the subject, he said, "was either that the work should stop short of metalling altogether, in all localities which, from the nature of the soil and the vicinity of good material, are not exceedingly favourable, or that no expense should be spared in making the metalling substantial in the first instance, and keeping it in the highest possible order ever after." Speaking generally, he laid down the position that roads are wanted, not good roads, observing, that "the tracks that are in use may be made into roads for *Rs.* 100 the mile, though they could not be made into 'good roads' for *Rs.* 1,500 the mile; but the benefit to commerce from 150 miles of road would be many times greater than will ever be derived from 10 miles of 'good road.' In these remarks Captain Best has left much valuable information well deserving the attention of the officers of the Road Department, and indeed of all officers who have charge, or are in any way connected with the repair and maintenance of roads.

"Following Captain Best's observations on the expediency of not metalling cross roads, observations in which the Right Honourable the Governor in Council most fully concurs, it appears desirable that the cross roads of the country should for the most part be made upon the principle suggested by that officer in the concluding quotations given in the preceding paragraph, and that metalled roads for such communications should only be the exception. Captain Best has shown, in his illustration, that a metalled road out of order is far more difficult and distressing to the cattle employed in draught upon it, than a road not metalled, in its ordinary condition. In the opinion of Government, all that such roads require is, that they shall be judiciously traced with bridges and raised embankments where there are swamps, and good drainage; and they will then be sufficiently good for all the purposes of the traffic of the country in its present state.

"In regard to Trunk Roads in general, it would seem to be unnecessary to adapt them to fast traffic; roads so perfect seem to be beyond the present wants of the country. The great Western Road may be considered an exception, as carriages for fast travelling have come so greatly into use upon it; but even this road need not be made so perfect as an English highway. All that is requisite, at present, is

to

to maintain it in such a condition that carriages drawn by horses can pass over it with facility at a moderate speed, although without such ease to the traveller as would be afforded if it were perfectly smooth and even. What is essential is, that the roads should be kept in the intended condition by prompt and effectual repairs, made as they are needed. It is quite sufficient that fast coaches can go rapidly on the Western Trunk Road, although it may not be so smooth and even as the perfect high roads of England.

" It is a question for consideration, whether trunk roads should always be metalled; whether, where there is not traffic to call for it, or where there are not facilities for obtaining good material, or where the traffic may be considerable and no such facilities exist, the formation and maintenance of a second road would not be more expedient than metalling a single one."

Amount of the improvement that would be effected under that order.

415. The roads now existing in this Presidency may be divided into three classes: 1st, roads partially bridged and metalled, but not kept by any means in first-rate order: such is the Western Trunk Road; 2d, roads formed and partially bridged, but unmetalled: such are the best in the Tanjore and Salem districts; 3d, tracks just practicable for carts for two-thirds or three-fourths of the year. Of the first of these classes there is a very limited extent, not more than from 300 to 400 miles; of the second class there is rather more, possibly 2,000 miles; but the vast bulk of the communications of the country are of the third class. Captain Best was in favour of confining expenditure in a great measure to a slight improvement of these last; he stated his opinion that *Rs.* 100 a mile would make the present tracks sufficiently practicable for carts; and that the greater part of them might be kept so at an outlay of *Rs.* 10 a mile annually in repair, while hardly any parts would need more than *Rs.* 50 a mile.

We imagine, however, that no one would contend that *Rs.* 100 a mile would be sufficient to render even practicable for carts any of those important lines which traverse the Eastern and Western Ghauts, heretofore called cross roads and hardly regarded at all, but which, if really opened to cart traffic, would speedily be found to be main lines of trade. Had the passes in Canara been treated in such a niggardly way, the country would have been still as much shut up against traffic and the movement of troops as it was in 1830; and the splendid results already described (para. 402) which have followed a more liberal course, would have had no existence. We must suppose, therefore, that the argument is intended to refer to the plain country only, and we will consider it in that regard.

The improvement proposed could effect no more than to make practicable the places now impracticable, or all but impracticable; it might also suffice to dig side channels, but it could do no more. It could not improve the surface, it could not bridge the nullahs, it could not form causeways across the swamps and rice flats; the swamps, the cotton ground, and the nullahs, would remain as fatal obstacles to traffic as at present. On such roads as these would then be, a cart can carry in fine weather 750 or 800 lbs., or about a third of a ton, and the day's journey is 10 miles; the cost of carriage varies a little, but it may be taken at three annas a ton a mile. In the countries under the influence of the south-west monsoon, such roads must be useless at least 130 days in the year, and under the north-east monsoon about half that period, from the absence of means to cross the rivers and nullahs; and from the bad state of the surface of the road during and after rain, which would be very much aggravated by any increase of traffic. Thus a third of the year in the former case, and a sixth in the latter, is lost to trade and to military movements.

The effect of such limited operations.

416. If the country were to be left to roads of this description, some sorts of raw produce which seem likely to form staple articles of trade would be to a great extent shut out from a market: such are oil seeds, which are already becoming an important article of export from the tracts on the sea-board, but which would never bear the cost of transport from the inland districts, on such roads as we are now treating of. Mr. Boothby's letter, in Appendix (P.), refers to the loss and inconvenience entailed on the establishment with which he is connected, not only by the want of a good road to send the manufactured sugar to the coast for shipment, but also by the very bad condition of the country roads by which the raw material must be brought to the factory.

Merely to state the rate of carriage-hire on such roads, indeed, by no means repre-

sents their effect in checking communication and enterprise of every kind. The traffic on them is subject to continual delays and accidents, which greatly enhance the real cost of carriage. They cannot be used by travellers whose time is of value; three and a half, or at the utmost four miles an hour in a palanquin, or, as an alternative, stages of 10 or 15 miles daily on horseback, are all that they admit in the finest weather; while, during the monsoon or in rainy weather, a traveller can never be certain that he will not have to pass the night on the bank of some one of the many unbridged streams which cross them. The difficulty, tediousness, uncertainty and expense of travelling in this country, is probably the chief cause which keeps the European merchants of the Presidency ignorant of matters in the interior, and deters them from extended operations, when they can be so little within their own cognizance; and in this way, not less than by increasing the cost of transport, the bad state of the roads greatly impedes commerce.

The Western Trunk Road.

417. Such, however, would be the roads to which, under the operation of the order of Government above quoted, the greater part of the trade of the country would be condemned. We will take in comparison with them the best road which at present this Presidency can boast, viz., the Western Trunk Road. We cannot give the actual cost of this road, because during the time that it was in gradual course of formation, it was subject to the continual wear of a heavy traffic, in some parts as much as a thousand carts a day; it is known, however, to have been much more expensive than it need have been, because the line was so unfortunately selected, that in many parts material is not found within six or eight miles. In most parts of the country, and on lines where no mountain-pass or large river is met with, about *Rs.* 1,500 for construction and bridging, and *Rs.* 1,000 more for metalling, would make as good a road as this, and the allowance for maintenance, as estimated by Captain Best, would be three quarters of a rupee a year for each mile for every cart passing daily; that is, when 400 carts pass daily, *Rs.* 300 a mile would be sufficient for the annual repair of one mile.

On this road carriages specially made for the purpose can travel six miles an hour, with much discomfort to the traveller, and no little injury to the vehicle; carts can carry 1,600 lbs. and travel 15 or, in dry weather, 20 miles a day. It is never so bad as to stop traffic entirely; but, at times, in spite of exertion to keep it in order, it is so very much broken up, as to occasion much delay and uncertainty in the time of arrival of passengers and goods.

The low cost of carriage on that road.

418. Captain Best objected to such a road as being worse than those altogether without metal; he "showed in an illustration," to quote the words of the Government, "that a metalled road out of order is far more difficult and distressing to the cattle employed on it than a road not metalled, in its ordinary condition." This, however, is a misconception on the part of Government; the drawing or illustration offered and accepted as a proof, was in fact no proof at all; it simply took for granted the whole thing to be proved. That Captain Best was in truth wrong on this point is clear from the fact, that the cost of carriage is very much lower on the Western Trunk Road than on any other road in the country; it is not merely lower than on the common, unmade and unbridged roads to which this order would confine the greater part of the trade of the country, but it is much lower than even on the much-vaunted roads of Salem, and so much lower, as greatly to overbalance all that has been spent upon it. The load carried by a cart on the Western Road is more than one half greater than on the Salem roads; and a longer distance is travelled daily.

Cost of construction and maintenance of a really first-rate road.

419. But this road is far from being in first-rate order. It is not even fully bridged, and the surface is so bad, in consequence of the sums allowed for maintenance being quite unequal to supply the wear of the very heavy traffic on it, that carts work on it by no means to the best advantage.* The new road now in course of formation from Madras to Trichinopoly affords the means of judging what would be the cost of constructing a road equal to an English turnpike-road; and upon that data we estimate it at *Rs.* 3,000 to *Rs.* 3,500 a mile. And judging from the experience

* We should add, however, that an estimate of *Rs.* 1,16,000 has lately been sanctioned for re-metalling the 125 miles of this road, which it is hoped will greatly improve its condition.

experience of the Agra and Bombay Trunk Road, and making an allowance equal to double the latest estimate for annual repair on the western road, such a first-rate road will require about 1½ pice (less than a farthing) per ton per mile annually, to keep it in good repair. Such a road would admit of a cart, with a pair of bullocks, carrying 1,800 lbs., and even sometimes a ton, as is actually done on the Columbo and Candy road, and travelling with ease and certainty 20 miles a day. The cost of carriage on such a road, calculated, as in the other case, without consideration of the original cost of construction or of maintenance (to which we shall advert presently), and estimated from the existing charges, would be about one anna (1½ *d.*) a mile a ton. Such a rate, we may remark, though it may appear low in England, is in reality very high compared with the rates actually current there, if due allowance is made for the difference in the value of money in the two countries. Another great advantage from such a road would be its effect in increasing travelling by rendering fast travelling practicable and moderately cheap. Its effect on the intercourse between the coast and the interior, the merchant and the producer, would be akin to that produced in England by the introduction of railways. Personal communication would be substituted for written correspondence, and commercial operations would be undertaken which now are not thought of.

Value of a first-rate road and of an "improved track" compared.

420. To show definitely and practically how small a traffic will repay the cost of converting the very lowest description of road into the very best, we will take the case of a piece of road rendered practicable for carts by the expenditure stated by Captain Best to be sufficient, viz. *Rs.* 100 a mile, and with an annual allowance for repair of *Rs.* 20 a mile; the road being thus kept in such a condition that a cart can carry a load of one-third of a ton 10 miles a day for 300 days in a year without material injury to the goods, or serious risk of accidents. We will take a distance of 10 miles, being one day's journey on such a road, and will suppose that there is a traffic of 30 loaded carts daily. The annual expense of carriage will then be as follows:—

	Rs.
Interest on the first cost of the road, viz., *Rs.* 1,000, at 5 per cent.	50
Repairs, at *Rs.* 20 a mile	200
Hire of 30 carts, at *Rs.* 100 a year	3,000
Total Cost	*Rs.* 3,250

being at the rate of 1 anna 8 pice per ton per mile.

To carry 3,000 tons 10 miles on a first-class road would employ 5½ carts for 300 days; each cart carrying, on an average, 2,000 lbs. 20 miles: the following then would be the cost:—

	Rs.
Interest on *Rs.* 35,000, the cost of making the road, at 5 per cent.	1,750
Repairs for weather and a traffic of 10 tons daily, at *Rs.* 50 a mile	500
Hire of 5½ carts, at *Rs.* 100 a year	550
Total Cost	*Rs.* 2,800

being at the rate of 1 anna 6 pice per ton per mile.*

We have here supposed that the carts travel only the same number of days in a year on the good road as on the bad one; but this is giving an unfair advantage to the latter in the comparison, for, in point of fact, travelling is often impossible for days and weeks together on the unbridged country roads. Yet even on these terms it is found that even so small a traffic as 3,000 tons a year would fully pay for the cost of forming a first-class road; and would, besides, give a reduction of 10 per cent. in the cost of carriage, in addition to the still larger and more important advantages of speed, safety and certainty. Nor must we omit that in any such case a large increase of traffic would inevitably follow.

A still greater gain would be found in a rainy or mountainous district.

421. A still greater gain, by a good road, would have been shown, if we had taken

* Carriage could not be procured under these circumstances at so low a rate in either case, as we have in both reckoned only the actual cost, without allowance for loss of time in taking and delivering loads, &c, or for profit.

taken for the comparison a road under the south-west monsoon. Every bridge in such a country is worth double what it is in the dryer districts under the north-east monsoon; indeed, in such localities, there are many miles where no cart traffic can take place at all without some artificial surface, and where neither *Rs.* 100 nor *Rs.* 500 a mile would make a practicable road.

In rainy and mountainous districts the difference between the first cost of a good and of a bad road is diminished; while the cost of keeping the well-drained road in good repair is less than that of keeping the soft and undrained track in a state practicable for carts. And if we could show in figures the full advantages of the change in the condition of the roads, it would be found that if *Rs.* 100 would pay the annual cost of a cart and bullocks on a good road, *Rs.* 120 would not be too much to allow for the losses incurred from accidents and wear on the unmade track, which we have assumed at *Rs.* 100 in each case. It would be seen also that the charges for more secure packing, and the loss by injury to the goods, by the over-turning of carts and detention in the rain, whenever overtaken by bad weather, would have added 15 or 20 per cent. more to the advantages of the good road. The real difference in the cost of transit being probably more nearly 50 than 10 per cent.

A more careful consideration of this question is necessary.

422. The facts thus brought forward prove to our minds that this subject requires more careful investigation than it has yet received; and we feel sure that if the question had been brought to the test of such simple calculations, it never would have been determined that the direct road from Cuddapah to Madras should be opened as a "second-class road;" * or, in other words, an exceedingly bad road, unbridged and unmetalled, too rough or too soft and miry to be travelled at a greater speed than $2\frac{1}{2}$ miles an hour, closed with every heavy shower, and quite impassable in the rainy months. Mr. Boothby's letter, in Appendix (P.), shows the necessity for a road being rendered equally serviceable throughout the year. We find also that Dr. Wight urged Captain Best (*vide* the Superintendent's letter to Government, 14th February 1851) to place the road from Coimbatore to the western coast in such order that his cotton might reach Cochin early enough to be shipped in the first vessels that sail after the monsoon, "as, in order to do this, the land journey must be made in the monsoon." The loss to trade must be very great when a road is impassable during several months of the year. It is a mistake to suppose that trade ends when the rainy season commences, from any other cause than from the roads being impassable; and Captain Best, in the letter just referred to, attributes the falling off in the traffic on the Palghaut line, not to the rain, but to the "muddy" state of the road.

In a military point of view, roads without a hard surface, or bridges, leave the authorities helpless in all the monsoon districts for three or four months in the year.

Estimate of the cost and the effect of perfecting the Western Trunk Road.

423. Having shown that a highly finished road would repay its cost, even where the traffic was only 3,000 tons a year, it can hardly be doubted that it would answer to perfect such a line as the Western Trunk Road, on which the traffic, by late calculations, amounts to 670 carts a day, 80 per cent. of which may probably be loaded; and where making great allowances for light loads, the tonnage cannot be less than 100,000 tons a year. To show the advantage, even to the slowest traffic, of perfecting that road, and keeping it in the highest possible order, we will take the estimate lately sanctioned, amounting to *Rs.* 1,16,000 (11,600*l.*), which it is expected will render the line (125 miles) quite complete, if sufficient allowance is made for the constant wear of the road while the work is in progress. We will suppose also, what is probably nearer the truth than any of the sanguine estimates yet made, that *Rs.* 600 a mile a year will be necessary for the maintenance of the road.

The average annual cost of repairs in the last six years has been about *Rs.* 470 a mile, with which the line has been somewhat improved. The yearly cost of maintenance only is estimated by the Superintendent at *Rs.* 320 a mile. The comparison now and after the completion of the road will thus be as follows, omitting

* Such was the resolution of Government; but the formation of a road, even of this inferior quality, on that important line, appears now to be indefinitely postponed.

ting in both cases the interest of the original cost of the road up to the present time, which is common to both:

	Rs.
Present cost, 125 miles, at *Rs.* 320 - - -	40,000
Cost of completion - - - - - - -	1,16,000
Interest on that amount, at 5 per cent. - -	5,800
Repairs, 125 × 600 - - - - - - -	75,000
TOTAL - - -	80,800
„ - - -	40,000
Difference - - -	*Rs.* 40,800

Dividing the additional annual charge, *Rs.* 40,800, amongst the 100,000 tons on the road, we have $6\frac{1}{2}$ annas a ton; and, as the length of the road is 125 miles, the charge on each ton will be a trifle more than half a pie a ton per mile. And the present cost of carriage to and from Madras, being on the average about $1\frac{1}{2}$ annas a ton per mile, the cost will be repaid if the performance on the road can be increased by 1-32d part; in other words, if 60 lbs. can be added to the cart-load, or half a mile to the distance travelled in a day; and no one who has ever seen the carts moving on the Western Road will doubt for a moment, that if the road was in the condition of an English turnpike-road, each cart would benefit very much more than to that extent by the change, and this is proved also by the Candy road, where, as before said, carts travel at all seasons 20 miles a day, carrying commonly 1,800 lbs., and occasionally 2,240 lbs.

Conclusion on the question.

424. The conclusion to which the foregoing considerations conduct us is this: that so far from the common tracks, improved as proposed by Captain Best, being all that the country requires, an exceedingly moderate amount of traffic is enough to make it economical to construct a first-rate road, such a road as we cannot now show a single mile of in the whole country, and to maintain it in perfect order. A vast extent of the roads which, if repaired agreeably to the order of Government on which we have been commenting, would have no perceptible effect in reducing the cost of transport or augmenting the traffic, ought to be made in this perfect style. In every case a careful calculation should be made as to the amount of traffic actual and to be reasonably expected, and the quality of the road to be made should be so determined; and whenever a road inferior to the very best shall, after such careful inquiry, be deemed sufficient at first, its quality should be raised to that standard, as the traffic upon it is found to exhibit or to promise commensurate increase.

Under the existing rules, the greater length of inferior road aimed at by Captain Best could not be attained.

425. Before leaving this subject, we must say, in justice to the late Superintendent of Roads, that the opinions expressed in his report above referred to were apparently based on the supposition that the sum to be applied to the improvement of the roads was to be confined within very narrow limits; and his object seems to have been to make the most of a scanty allowance. But even under this supposition, a consideration of great moment seems to have escaped him: if the sum allowed was to be so attenuated as only to suffice to render the whole of the roads of the Peninsula practicable for carts in fine weather, and to keep them so, how was this improvement to be effected? Government, it is true, had promised help in any instance that was brought before it, but expenditures were not to be made till plans and estimates had been well prepared, or till assurance could be given that "dependence could be placed on the energy and exertion and means of the local officers to carry out the works suggested," or, as in the case of the Cocanada Road, until the Civil Engineer officers could pay attention to their execution. With this condition attached, a general declaration of intention to improve all the roads of the country must necessarily be inoperative, because of the insufficiency of the present professional establishments. It is impossible now, as it has ever been, to make surveys, plans and estimates of extended lines, or to execute work on such a scale under the eye of an Engineer officer, and the result has been exactly what might have been expected, that sanction was granted for a bad road instead of a good one, with no corresponding extension of length. Even, therefore, supposing the total sum allowed to be too limited, it would still be well to make the most of the

the little engineering skill available for road-making, and to perfect each line under repair (as far as the traffic justified the expenditure) while the officer was employed upon it, rather than to talk of the advantages of lines of great length, which under existing circumstances could not be undertaken.

The Harbours of this Presidency.

The harbours have been much neglected.

426. In this place we are anxious to make some remarks on one species of public works, which has unfortunately been more neglected perhaps than any other; we mean the conservation and improvement of the various ports on the coasts of this Presidency. The total number of the ports or places at which cargo is received and discharged is 144, along a coast line of about 1,600 miles. Of this number, 19 are called principal ports, being those of the most importance; the number at which port dues are levied is 57. As regards large ships, the anchorages at all these ports are open roadsteads, but at very many of them country vessels are able to cross the bar into a river or backwater; and a little judicious assistance in controlling and directing natural agencies would very much extend the usefulness of such harbours. Up to a recent period this subject appears to have been entirely overlooked or neglected; and it is no wonder that some of the most valuable ports on the coast have become very much deteriorated within memory. Of late years, some trifling remedies for the evil have been proposed in a few instances, but the applications to Government for assistance have not been by any means invariably successful. We have not the materials, nor would this be the place to attempt a review of all the ports on the coast or their wants; but it may be useful to notice a few where the need of improvement has been most strongly brought to notice.

Coringa: its value and importance.

427. The first which we will notice is the port of Coringa, including Cocanada. This port, for the anchorage is one, is at the mouth of the Godavery River, and from its situation, therefore, of the greatest importance, as the natural entrepôt of the produce of the delta of that river, now in course of being supplied with irrigation, and certain to yield large quantities of valuable produce, and as being also the outlet for the vast country which will be opened up as soon as any attention is bestowed on the navigation of the Godavery River itself. And independently of its position, the port has great advantages. It is the only secure harbour between the Hoogly River and Trincomalee, and is accessible at all seasons without difficulty to ships of any burden: from its nearness to the teak forests on the Godavery, even with the present very imperfect means of transporting the timber, it is a very cheap place for effecting repairs, and ships of 500 tons have been built in the river. Having been entirely neglected, the port has very much deteriorated, and there is now no more than three feet water on the bar at low water, and at the most favourable times of tide vessels drawing more than eight or nine feet cannot cross. So far has this process of silting up extended, that, from the lengthening of the mud-bank abreast of Coringa, a boat is sometimes two or three days in making a single trip from that place to a ship in the anchorage. Even with all these disadvantages, the trade of the port is very considerable; it has expanded very greatly of late years, particularly since the recently-constructed irrigation works have come into operation to cheapen production, and it will infallibly continue to increase, especially when the Godavery is open to inland navigation. The statement in the margin shows the value of the imports and exports for 16 years. It will be seen that the value of the exports, the true criterion of the thriving condition of the district, has very much increased of late years. In 1835–36 it was about half what it was in 1850–51, the last year in the table; it then fell off for several years, till, in 1840–41, it was only three lacs. Since then it has risen almost every year, and in 1850–51 it was very nearly 14 lacs. The total amount of the trade, both import and export, is now 17 lacs of rupees a year, or 1,70,000 *l.*, and it has increased nearly 250 per cent. in the course of the 16 years included in the table. The number of vessels that visited the port in the year ending 31st July 1850, was 392, with an aggregate tonnage of 57,511 tons.

Years.	Exports.	Imports.	Total.
	Rs.	*Rs.*	*Rs.*
1835–36	7,03,334	48,934	7,52,268
1836–37	6,86,368	1,03,693	7,90,061
1837–38	6,46,114	98,085	7,44,199
1838–39	4,22,141	4,69,898	8,92,039
1839–40	3,64,839	1,23,428	4,88,267
1840–41	3,06,646	9,29,549	12,36,195
1841–42	4,59,362	3,67,556	8,26,918
1842–43	5,64,375	2,42,347	8,06,722
1843–44	6,33,991	92,101	7,25,092
1844–45	7,29,287	3,07,317	10,36,604
1845–46	9,06,554	3,76,930	12,83,484
1846–47	13,53,503	4,00,191	17,53,694
1847–48	10,95,397	6,27,061	17,22,458
1848–49	10,56,727	4,40,620	14,97,347
1849–50	9,76,719	3,28,033	13,04,752
1850–51	13,94,638	3,01,794	16,96,432

428. In

428. In Colonel (then Captain) A. Cotton's first Report on the irrigation of Rajahmundry in 1844, the importance of this port is referred to in the following terms: "Till I visited the district, I had no proper idea of the great value and importance of the port of Coringa; first, as being the only shelter for vessels between the Hoogly and Trincomalee, and secondly, in connexion with the teak timber trade of the Godavery; and I was astonished to see about 200 vessels docked there, many of them large ships. The bay is a perfectly secure anchorage, very large vessels can be brought into the river, and teak timber of excellent quality is brought down at a very low price. Such a port ought to be most watchfully cared for, and every plan that could be thought of to secure the full advantages of it should be adopted by Government. But so greatly has it been neglected hitherto, that not only has no attempt been made to improve it, but from what I could learn, nothing has ever been done even to preserve it; everything has been allowed to take its own course. For instance, the banks of sand have greatly extended off the mouths of the Godavery of late years, as must necessarily be the case with such a river; but no new survey of the coast and roads has been made, nor instructions for entering the port published for many years. When a survey of the district, made 20 years ago, was shown to the commander of a vessel who knew the port, he could hardly recognise it, so greatly had the banks which appear above water extended. Again, I was assured that there is a heap of ballast in the harbour, discharged by some ship, and perhaps there are many others; a vessel also discharged her ballast in the small branch of the Godavery, upon which all the docks are situated, the only one having deep water over its bar, and it has never been removed, forming a serious obstacle to vessels passing up and down.

Notice of it by Col. A. Cotton.

"But not only ought the harbour to have been preserved from injury, it seems certain that it might have been greatly improved. In the first place, the bar at the mouth of the Coringa branch of the Godavery is not a bar of hard sand, brought down by the river, but simply a flat of the softest mud, so that there can be no doubt that it might be kept down by dredging. There is, I am informed, about nine feet water over it at present, and if it was deepened a few feet, very large vessels might be loaded in the river, instead of at the anchorage two or three miles off. There is also another small river entering the harbour at Cocanada, the mouth of which is totally neglected. Many ships are loaded from this river, and very great additional facility might be given to this, if this river was attended to. It is the more remarkable that nothing has been done for this most valuable port, inasmuch as it would have itself provided the funds. The port dues are at present most insignificant, about *Rs.* 30 for a ship of 400 tons, I understand. Even with a very moderate charge, such as a quarter of an anna a ton, a very considerable fund could be raised, which, if constantly and judiciously expended, would provide for many improvements being gradually effected. It seems extraordinary that this port should not have been more frequented by European vessels needing repairs than it has been; its immense superiority to Calcutta, and even to Moulmein, in accessibility, the trifling expenses of the port, the cheapness of the teak, provisions and labour, and the excellent quality of the timber, would seem to point it out as incomparably the best port for repairing vessels in the Bay of Bengal. I am informed that it is beginning to be thought more of by the masters of European vessels, and that it is likely to be much more frequented."

429. In 1847, the extension of the mud bank in front of Cocanada, had proceeded so far as very seriously to interfere with the growing trade of that place, by the increased tediousness and expensiveness of communicating with the shipping. The merchants brought the subject to the notice of the same officer, as Civil Engineer of the division, and he, with the concurrence of the Collector, commenced to re-open the direct passage by a cut through the bank, on an estimate of *Rs.* 1,500. While the work was in progress, it became evident that the cut could not be kept open under the action of the tides and surf, without an artificial work at its outer end. To form such a defence or breakwater, the merchants interested in the port subscribed a sum of nearly *Rs.* 800, and with this sum a groin of rough stone was commenced; but the funds were insufficient either to complete the cut or to construct a sufficient breakwater.

Some trifling measures to arrest deterioration, undertaken by the local authorities;

When the bills for the work of the year went in, explanation of this item was asked for, and it was supplied by Captain Orr, the Acting Civil Engineer, in the absence of Major Cotton on sick certificate. Captain Orr stated that the work was undoubtedly correct in principle, and that it had answered the end sought, as

far as could be expected from it in the imperfect condition in which it had been left from the want of sufficient funds. He also stated, that from the extension of the bank, a boat could hardly make one trip to and from the shipping in a day;* whereas, if the direct passage were opened, larger boats might be employed, and might make three trips a day. Hereupon the Board of Revenue recommended the expenditure for the sanction of Government, but it was refused till further detailed information should be received.

But disallowed by the Government.

430. In replying to the requisitions for this information, Captain Orr reported, that since his former letter the cut had been made completely effective by turning into it the whole stream of the river, by the expenditure of a small sum of money liberally contributed by the Collector personally; and he solicited the sanction of Government to a small estimate of 1,526 rupees to close the old channel. This request was warmly supported by the Board of Revenue in the Public Works Department, who represented the work as "indispensably necessary to keep the new passage open;" but it was refused by the Right honourable the Governor in Council (11 January 1850), on two grounds; 1st, That until the irrigation works in connexion with the anicut were completed, he would sanction no other work in Rajahmundry; and 2d, That he would "concur in no scheme for improving the port of Cocanada, until complete plans, specifications and estimates of the entire project are submitted." The first of these reasons is the same on which we have already remarked (Para. 336), in speaking of a similar refusal of a road; it is, if possible, even less logical here, because of the extremely small amount of the sum asked for. As to the second reason, plan, specification and estimate of the work contemplated had been furnished, and no additional documents of the kind could make it more plain than it was. It did not pretend to be a general scheme to improve the river, but a merely temporary and emergent work, until the Engineer officers could find time amid their pressing engagements, to investigate the whole subject.†

A trifling improvement has recently been undertaken by the local authorities, on their own responsibility.

431. This order was effectual to stop all attempt at improvement; for such complete investigation and report as it required was necessarily quite impracticable, from the want of officers with the necessary leisure. The progress of injury was, therefore, left to take its course for nearly three years more; till, in September of the present year, the state of the bar had become such as nearly to close the port altogether. The Collector and the Civil Engineer then conferred together; and the latter, Major F. Cotton, having prepared an estimate to a trifling amount (only 427 rupees) for work absolutely necessary, the Collector undertook its immediate execution, purposing to bear the charge himself, if Government should persist in its former refusal; a responsibility in which the Civil Engineer joined him.

The present inaccessible state of the port.

In his letter to the Marine Board, forwarding that estimate, Major Cotton thus describes the necessity for the work proposed, and its nature: "The case is this; the entrance to the port of Cocanada is now almost inaccessible, while there are more ships in the roadstead than have been seen at anchor there before. The entrance used at present is only practicable for loaded cargo boats, about the time of high water, and while the old entrance draws off half the drainage water of the country, the scour will be insufficient to improve it. The season has arrived for the great scour of the year by the freshes of the Yalairoo river; and if this chance is lost, we may feel sure that the water over the bar will be as bad during the ensuing year as it has ever been known, perhaps even worse.

"Under these circumstances, I made the proposal to Mr. Prendergast, that the old entrance should be closed, that we might ensure the full advantage of the freshes in the Yalairoo; and the operation of throwing a dam across the old outlet is now in progress by the means above mentioned. To have waited for an answer from Madras would have been to lose the season, which must account for my having commenced the work before sanction is received for the estimate."

In another passage, he thus speaks of the port: "Had the members of your Board seen the roadstead of Cocanada, as I did a few days ago, with 14 European ships and a number of coasting craft waiting for their cargoes from this wretchedly neglected and all but inaccessible port, I am sure you would agree with me in thinking that every effort to facilitate the passage between the landing place and anchorage

* In strong freshes, a single trip sometimes takes a boat two or three days, as already stated.

† The small expenditure in 1847 has not yet received the sanction of Government.

anchorage was worth the 100 *l.* I ask for." He here alludes to a request which he had just made that *Rs.* 1,000 should be deposited with the Master Attendant, to be promptly expended when required in removing obstacles to the flow of the stream, which thus guided will be useful in keeping the entrance open.

It is painful to see the great natural advantages of this place thus sadly neglected. No wonder the local authorities were ready even to lay out their own money in arresting the progress of destruction; and truly it may be said that their liberality and public spirit pointedly rebuke the inaction of the Government.

Measures now proposed by Colonel A. Cotton.

432. Colonel A. Cotton was anxious to go fully into the subject of the improvement of the port, feeling it to be essential to the prosperity of the district, but the pressure of his duties in connexion with the anicut occupied him entirely. Since he quitted that charge, he has lately drawn up a short memorandum, setting forth his views as to what is required, and the subject seems so important that we place that memorandum in our Appendix (JJ). The irrigation works at the Godavery, which have already operated so powerfully, by facilitating and cheapening the raising of produce, to increase the trade of the port, afford also the means of increasing its accommodation; for the anicut and connected channels will at all times secure water for a scour at the mouth. In his memorandum Colonel Cotton proposes some trifling work to both the Coringa and the Cocanada bars, to the amount of less than *Rs.* 15,000, as being urgently required without delay, and recommends further works of a more permanent character, to the amount of *Rs.* 1,09,000. The merchants and shipowners of the port are so anxious for these improvements, that they are quite willing that the port dues should be doubled, provided only the proceeds are devoted to this object; and Colonel Cotton points out that all the necessary improvements might be effected without any outlay or any risk of loss, by adopting that expedient which has been so universally acted on in England, viz., by raising money on the security of the port dues. The trade of the port will infallibly increase; and those dues, therefore, form an indubitable guarantee; and a judicious expenditure in removing the disabilities and inconveniences of the port will greatly facilitate that extension of commerce, and with it will hasten that development of the resources of the province, with which the increase of the Government revenue is so intimately bound up.

The importance of opening the Godavery navigation.

433. The opening of the Godavery river to navigation is a subject of such deep importance that we cannot forbear to say a few more words about it in this place.* That fine river, with its tributary the Wurdah, which for this purpose must be regarded as its proper continuation, flows a distance of 700 miles, and passes through the vast and fertile plains of the Berar country, of which it is the natural highway. The great staple of Berar is cotton, of a quality unequalled in any other part of India, and which is similar to Mobile cotton, and when equally well cleaned commands the same price in the Liverpool market. Even now, with the disadvantage of a long land carriage on pack bullocks, the annual export of cotton from this tract to Bombay and to Meerzapore united, amounts to fully 60,000,000 lbs., and the quantity obtainable, or capable of being produced, may fairly be styled unlimited; any considerable reduction in the cost of bringing it to the port of shipment would give it the preference over American cotton, and the demand, and consequently the production, would be enormously increased.† The opening of the navigation of the Godavery is all that is wanted to effect such a reduction. We have already said that this is the natural course of the trade, but the river having been utterly neglected it has been driven into other channels.

Present cost of the conveyance of the Berar cotton to the port of shipment.

434. Formerly the greater part of the cotton was taken 500 miles on bullocks to Meerzapore on the Ganges, and thence conveyed on boats 450 miles to Calcutta; now the greater part goes to Bombay, still wholly on pack oxen, the distance varying from 216 to 450 miles, according as the cotton is purchased at one mart or another. The hire of a bullock for the journey ranges from about *Rs.* 5 to *Rs.* 16, the chief cause

* We also beg to request attention to Appendix (KK.), being a letter from the Madras Chamber of Commerce to the Board of Revenue, on the importance of opening the Godavery navigation.

† In a paper drawn up for the Royal Asiatic Society in 1837, by Mr. Ashburner, a Bombay merchant, that gentleman states his opinion that, with good roads, the export of cotton from Berar would increase at the rate of 1,00,000 bales, or 30,000,000 lbs. a year, and would probably soon reach the amount of a million bales yearly. In the absence of improved roads, it has, in fact, scarcely advanced at all since that time.

cause of variation being the time of year: a load is about 250 lbs. But this is not by any means the whole cost of conveyance; the indirect expenses are much greater; the cotton is eaten by the bullocks, stolen by the drivers, torn off by the jungles through which the road passes, and damaged by the dust and the weather, as well as by having to be loaded and unloaded every day, often in wet and mud. The Bombay Cotton Committee of 1847 state their opinion, after careful calculation, that the whole charges of conveyance to Bombay, from the mart of Kamgaon, only 216 miles distant, being the nearest of all, do not fall short of *Rs.* 33 a candy (784 lbs.), the original cost of which at the latter place is not more than *Rs.* 50; thus the cost of carriage to the port of shipment is 66 per cent. on the price of the commodity. The usual selling price in Berar is under one anna ($1\frac{1}{2}$ *d.*) a lb., as we learn from Royle, as well as from the paper just quoted, and various other authorities; the absolute cost of the conveyance from the producing country to Bombay is therefore fully 1 *d.* a pound. And this, though it seems small, is in fact enormous on so low priced an article, so that in the Report of the Cotton Committee above referred to, the rise of even one halfpenny a pound at Liverpool is spoken of as operating most beneficially on the Bombay market.

The cost to Coringa by the Godavery.

435. And the opening of the Godavery navigation would effect a reduction in the cost of conveyance very much exceeding that amount. The great cotton marts of Oomrawutty, Hinghenghaut, Arwy and Woony, are close on the Wurdah river, and in those parts the article is even cheaper than at Kamgaon, which is less a centre of the producing tract than an entrepôt for the trade to Bombay. At the four places first named the price does not exceed $1\frac{1}{4}$ *d.* a pound. The Commissioner of the Northern Circars and Colonel A. Cotton, late Civil Engineer of the 1st Division, directed much attention last year to this subject, and from their reports it appears that even if there were no return cargo, but the boats were destroyed on reaching their destination, and hire paid to the boatmen for proceeding back on foot, still the cost of conveying the cotton from the place of production to Coringa for shipment would not exceed one-third of a penny a pound; and the Chamber of Commerce (Appendix KK.), justly assuming that there would be some little return trade immediately, especially in salt, compute the charge on cotton at one-fifth of a penny a pound. There appears no doubt that this amount of reduction may fairly be expected immediately, and ultimately it will be very much greater; for as soon as a little attention is devoted to the removal of obstacles from the navigation, and measures of improvement are adopted, which will cost nothing in comparison with their results, the river will speedily become a great highway of commerce; the cotton, the timber, and the various other products of the interior, will be brought down in exchange for the salt of the coast and the rice of the Godavery Delta. With a regular navigation established, we are fully warranted by experience in concluding that the cost of transport will not exceed two pice a ton a mile, and at that rate the carriage of a pound of cotton the whole distance to Coringa would cost no more than one-twentieth of a penny.

Immediate saving on the carriage of cotton, by opening that navigation.

436. But without looking so far forward, there is no doubt that as soon as the navigation of the Godavery is at all opened, the cost of transport to the place of shipment will immediately be reduced from 1 *d.* a pound to one farthing; and this would be equivalent to a reduction from 66 per cent. on the cost price of the commodity to $16\frac{1}{2}$ per cent. The saving in carriage would thus be $49\frac{1}{2}$ per cent. on the cost price, being several times the amount of a good mercantile profit; it may be conceived, therefore, how powerful an inducement would thus be created to the augmentation of the trade. The total gain in the diminished cost of the carriage of cotton only may be thus stated in figures. The present cost of conveying 60,000,000 lbs. of cotton to the shipping port, at 1 *d.* a pound, is 25 lacs of rupees; the same quantity conveyed by the Godavery route, even with very trifling improvements, would cost only one farthing per pound, and thus three-fourths of the present expenditure, or 18 lacs of rupees yearly would be at once saved, even without any increase of the trade, which however would certainly take place.

Gain in other ways.

And even the large money-saving would not be all; there would be much gain also in convenience of shipping. The land journey to Bombay occupies 60 days, and as the plucking season is the first three months of the year, and the monsoon begins on the western coast in May, great hurry is always necessary in order to get the cotton to the port in time, and save the loss of the season. By the Godavery route all this would be avoided. Not only would the distance to the port be traversed in nine or ten days instead of 60, but delay would be unimportant as regards season;

season; for the Coringa bay is quite sheltered from the S. W. monsoon, and the ships would lie in smooth water to receive their cargoes, and would have a fair wind to put to sea as soon as loaded.

Enormous increase of revenue to Government.

437. Hitherto we have spoken almost exclusively of the cotton trade, and considering the vital importance of that article to the industry of Great Britain, it deserves a forward place; but that is not the connexion in which the opening of the Godavery navigation is most important to the interests of the British Indian Government or of its own subjects, because the cotton is the growth of other than British provinces; but the return trade would directly and enormously benefit the revenue of the Government, by the demand which it would create both for sea salt and for grain. The people of the Berar valley are at present almost entirely cut off from the use of sea salt by the enormous cost of conveyance, and probably their annual consumption does not exceed 3 lbs. a head at the utmost, instead of 20 lbs. Were the carriage cheapened by water communication, it seems only fair to conclude that the consumption would rapidly increase to what it now is in the Madras territories, including Mysore and other tracts remote from the sea, viz., to 13½ lbs. a head. The population of the Berar valley cannot be taken at less than 10,000,000; and their increased consumption of salt at 10½ lbs. a head would amount to 11,000 garce, the monopoly price of which at the present rate would be *Rs.* 13,20,000, and deducting one-tenth of that for cost and charges, there would remain nearly 12 lacs of net gain in revenue in the single item of salt; and if the present very high monopoly price of the article were lowered, though the net revenue might not rise so high, the blessing of a full supply of this essential to health would be much more widely diffused.

The salt revenue.

The land revenue.

And, undoubtedly, the effect of the measures we are considering upon the land revenue would be hardly less powerful. The soil of Berar, so eminently favourable to the growth of cotton, would be, in great part, devoted to that object, and the abundant grain of the Godavery and Kistnah Deltas just now supplied, or in course of being supplied, with irrigation, would be required to feed the population; and it is impossible to exaggerate the influence of such a demand in developing the resources of those rich tracts, and it must be remembered that every acre brought under cultivation adds to the Government revenue.

Military and political advantages.

438. Nor must we overlook the advantages that would result in a military and political point of view. The relief of troops at the remote station of Nagpore, and the conveyance of military stores to that post are so difficult, tedious and expensive, that it has sometimes been contemplated to render the Godavery River navigable for the sake of that single object; and the importance of improving this line is now much greater than it was formerly; for all the troops in the Saugor Division now belong to Madras, and the communication with the other stations of the army and with the Presidency is by Nagpore. This latter place can now be reached from Madras only by a march of 500 miles from the port of Masulipatam, over such roads as we have described above; whereas if the Godavery were made navigable, troops and stores would be landed abreast of Woony, only 80 miles distant from Nagpore. Five-sixths of the land march would be saved; the distance from the coast to Nagpore would be accomplished in 16 or 18 days instead of two months; there would be a great saving of expense, both in the moving of troops, and still more in the conveyance of military stores; and the ravages of cholera, on the march, would probably be got rid of. The troops at Nagpore and in the Saugor Division number 11,000 fighting men. From inquiries that we have made, we suppose that this force must require about 400 tons of military stores yearly, and their conveyance, by the present wretched roads, cannot be taken at less than three annas per ton per mile, and is probably more. The Godavery route would substitute, for 420 miles of such conveyance, a water carriage of the same length, at not more than three pice a ton per mile. In addition, then, to the great gain in speed, there would be a positive saving in money to the amount of no less than *Rs.* 29,000 yearly on the carriage of stores for that 420 miles. And that sum yearly represents a capital of *Rs.* 5,80,000, which would probably be enough to make the Godavery efficiently navigable, so that the mere saving in the carriage of Government stores would pay for that vast improvement.

Such would be the advantages in the ordinary times of peace. In case of any differences between the British Government and the Hyderabad or Nagpore states there would be still greater. A hostile confederation between those two powers would be impracticable: the river would give us the facility of placing a force

on the flank or in the rear of either of them, and resistance would become hopeless.

The cost of the necessary operations on the river would be trifling.

439. And as the objects to be attained are thus important, so also there is good reason to believe that they might be accomplished at a trifling expenditure. The passage down the river has been ascertained to be feasible. About 25 years ago, the enterprizing firm of Palmer & Co., of Hyderabad, sent large quantities of cotton and timber down the river, for several years successively, from Woony, 427 miles up, and in the centre of the cotton country, to Coringa, on the coast; but on the bankruptcy of that house, these transactions ceased, and have never been renewed. What is now wanted, in order not merely to open the river to such imperfect navigation, but to make it a really valuable channel of commerce is, first, to clear away trifling obstructions, occurring at intervals, along the stream; second, to increase the supply of water during the short dry season; and, third, to arrange with the chiefs along its banks in the Nizam's country, to prevent the stoppage of boats for their exactions. As a preliminary to all these, it is necessary that the river should be carefully explored and examined; and with this view the Madras Government, in April 1851, laid before the Government, at Calcutta, the valuable information collected by the Commissioner of the Northern Circars; and in pursuance of that officer's recommendation, solicited authority to expend a sum not exceeding *Rs.* 10,000 on such examination, including the removal of minor obstructions to the passage of boats. This request was unsuccessful, as unfortunately the Calcutta authorities could not see any advantage to be gained by the project. To use their own words, "The President in Council was unwilling, in the present state of the finances, to incur this expense on an object, the utility of which he could not but feel to be doubtful." It is to be hoped that this denial will not be long continued; in its results the project promises to be one of the most important that have ever engaged the attention of the rulers of British India.

As to the cost of the works, the information existing is too slender to enable us to speak with confidence; but there seems reason to believe that all the obstacles to navigation, six in number, between Coringa and Woony, 427 miles up the river, may be removed at the insignificant cost of a few thousand rupees; and that a permanent stream, abundantly sufficient for steam navigation, for this whole distance, may be ensured all the year round, at an outlay not exceeding a few lacs, not more than half the probable yearly gain to Government by salt only, and about the cost of 10 miles of railway; while the same measure would also secure the delta of the river from those destructive floods which are now so lamentably frequent. As respects the third thing to be done, viz., the making arrangements with the chiefs along the banks of the river, it is most unlikely that any material difficulty should be encountered in effecting that, through the Political Agents of the British Government at the Court of his Highness the Nizam.

The port of Masulipatam.

440. Masulipatam is a large and populous town, and may be regarded as the capital of the northern districts of this Presidency. It stands on a shallow inlet, which winds through a marsh, and terminates seven miles from the sea, but the extreme point of which is or was connected with the northern branch of the Kistnah River by the Chinnapoor Canal, 5 ½ miles long. The town had formerly a very extensive trade, principally in piece goods, and maintained a constant and extensive commercial intercourse with Persia. Within the last half century, this latter branch of trade has almost entirely ceased, and the whole commerce of the port has very much declined.

Its great deterioration.

About the year 1790, there was never less than eight feet of water on the bar, and ships of considerable burden took in their cargoes at the fort. After that time, the depth on the bar became gradually diminished, till at present it does not exceed 15 or 18 inches. This lamentable deterioration of the port appears to be entirely due to the diminution of the scour, owing to two causes: first, the embanking of the marshes, about 1795, with the view of reclaiming them; and, second, to the filling-up of the Chinnapoor Canal, through neglect. In 1836, the port was carefully examined and reported on by Captain Buckle, the Civil Engineer of the division, who proposed various measures for its restoration. The total amount of his estimates was *Rs.* 32,272, and the whole were sanctioned by Government; but only a portion of the work, to the amount of *Rs.* 19,495, was executed; and among those omitted, were the most important for increasing the scour. The effect was not considerable, or it has not been permanent in consequence

sequence of subsequent neglect. We have already noticed (*see* para. 337), the very bad condition of the roads from Masulipatam into the interior, viz., those to Hyderabad and to Ellore; and there can be no doubt that whatever other causes may have tended to the declension of this once thriving place, the deterioration of the port, and the wretched state of its means of communication with the interior, must have operated powerfully to produce such a result.

Means of restoring it.

The new anicut, now under construction, across the Kistnah River, at Bezwarrah, will afford the means of easily improving the port, for it will give a permanent flow of water, which, judiciously managed, will speedily lower the bar. It will also greatly increase the exportable produce of the country, of which Masulipatam is the natural outlet, and it will supply water communication throughout the Delta. It is much to be desired, therefore, that the important object of improving the port should not be lost sight of. Masulipatam is even now a place of considerable trade for the Hyderabad country; and with its accommodation improved, with a good road to Hyderabad and Ellore, and with the great advantage of inland water communication, it may confidently be expected that it will ere long regain much of its former prosperity.

Negapatam harbour.

441. The next harbour which we will notice is that of Negapatam in the Tanjore District. This port is formed by three streams which there fall into the sea, being the drainage of a large expanse of irrigated rice land. It is a place of active trade, being the chief place of export for the grain of the Tanjore country to Ceylon and elsewhere, and many vessels of small size are built and repaired in the river. The trade of the port has increased greatly of late years, and the Customs revenue amounted in 1849 to *Rs.* 87,000, and is no doubt more now: in the year ending 31st July 1850, 550 vessels visited the port, with a tonnage of 30,409 tons.

Its deterioration; some remedies successfully applied.

This harbour, like those already noticed, has undergone much deterioration, by the filling up of the basin and the shoaling of the bar, the most active cause being the diversion of a portion of the largest of the three streams very many years ago, which diminished the scour. Being the head station of so important a province, this place has been fortunate in obtaining somewhat more attention than most of the other ports; and in 1845 some measures proposed by Captain E. Lawford, the Civil Engineer of the division, for arresting the progress of deterioration, received the approval and sanction of the late head of the Government. The chief of those measures was a straight cut to bring back the stream above alluded to into the harbour, and in a direct course; and with this some minor works were combined, for concentrating the effects of this scour and giving them a right direction. These works were gradually executed in the course of the years 1846 to 1849, at a total outlay of *Rs.* 9,010 (901 *l.*); and in the early part of 1849 the Civil Engineer reported their complete success so far, in deepening the harbour and the bar, and the certainty that the effect would be the permanent improvement of the port to the great advantage of the trade; and the Government acknowledged the result of the expenditure to be "very satisfactory."

Further inexpensive measures proposed, but refused by Government.

442. On the 30th May 1850 Captain Lawford proposed some further work to the port, at the small expenditure of *Rs.* 2,635, the object being to deepen a part of the harbour, so as to provide more room for vessels under construction or repair, as well as for vessels entering the port for shelter in the N. E. monsoon, and so to leave the main channel clear of these obstructions.

The reply of the present Government to this application, which went up with the recommendation of the Board of Revenue, was an inquiry whether the ship and boat-owners and builders of the place would contribute anything towards the improvement, or would pay a fee for the use of docks in the harbour. Those parties, when called upon, were unwilling to contribute towards the expenditure, but expressed their readiness to pay a tax of one anna on every *Rs.* 100 value of imports and exports, which would yield a sum of from *Rs.* 1,200 to *Rs.* 1,500 a year on the existing trade. The Collector recommended that the proposal should be accepted rather than that any fee should be levied on the docks, which were formed wholly by private outlay; and the Board, in supporting that recommendation, again solicited sanction for the trifling sum, 263 *l.* 10 *s.*, before applied for. The Government refused this application. No reason is assigned, nor is it easy to supply any; for all and more than all that the Government can be supposed to have aimed at in asking for local contributions, had been willingly given by the people. They had declined, indeed, to pay down any part of the expenditure beforehand;

beforehand; but they had voluntarily tendered a contribution, which would have repaid in two years the whole of the very small sum required, and would have supplied a permanent and growing fund for further improvements. This, however, was not approved, and the port remains in its former condition.

The reasons of that refusal.

443. It does not appear to us singular that this call upon the people of the place to provide a part of the outlay was not responded to. The calling of those people is to make money, and that by certain customary means; it is true that the measures proposed promised to increase their opportunities of making money, but it was indirectly, and by a species of enterprise into which they had never yet entered. It is not fair to expect largeness of view from men of that class. The interests of the Government also were intimately involved in the measure, and, probably on the whole, they would gain quite as much as all the mercantile class taken together; yet they shrank from the petty expenditure required, and it does not appear how they were entitled to look for more comprehensive views in the traders of the port.

Indeed, the proposal was one which probably would not have found acceptance with communities much more wealthy and enterprising. When private capitalists or corporate bodies undertake the improvement of ports, the formation of docks, &c. in England, it is in expectation of direct return in the form of tolls or dues, rarely on the mere general expectation of sharing in the common gain of increased convenience. In the present case the Government were to engross all the direct gain accruing through the increase of port dues, while they called upon the local community to furnish funds for the expenditure.

Cuddalore and Porto Novo harbours: both much shallowed of late years.

444. We will next notice the ports of Cuddalore and Porto Novo, both in the South Arcot District. These are similar in character to Negapatam, but perhaps of greater capabilities. Porto Novo is at the mouth of the Vellour, a river of considerable size; and Cuddalore is at the mouth of a smaller river, but upon an extensive backwater. Both have suffered much from the unopposed action of the same causes already noticed as in operation in the other ports which we have named. Neither of them, however, appears to have obtained much attention till lately; but both the Collector and the Civil Engineer have now written urgently to the Marine Board, representing the decided deterioration of both harbours, and the pressing necessity for some measures to arrest the progress of the damage. At Porto Novo the merchants have also made loud complaints on the same subject. We have already, in our sixth section, in speaking of the Chellumbrum and Manargoody talooks of South Arcot District, mentioned the deteriorated condition of the harbour of Porto Novo as one of the causes of the unsatisfactory state of the land revenue of those talooks.

Easy means of improving them.

445. Captain Lawford has examined both that port and Cuddalore, and he expresses the decided opinion that both may be made very good harbours for vessels, and that the communication with the shipping in the anchorage may be very much facilitated. The means by which he proposes to effect this are the same which had been applied under his advice to the port of Negapatam, and with such satisfactory results so far as they were used; viz. by concentrating the land floods, and the formation in each case of a deep unobstructed tidal reservoir, with a jetty or groin for the purpose of continuing the action of the flux and reflux into sufficiently deep water. There is already a canal from the lower Coleroon anicut to Porto Novo, as we have before noticed; and by means of this the water of the Coleroon river may be used as a scour at that port; and Captain Lawford proposes to excavate a canal from Porto Novo to Cuddalore, by which not only the harbour at the latter place may be improved in like manner, but a valuable extension of the water carriage will be obtained. As a matter of course the present extremely defective condition of the first mentioned canal, spoken of above, must be improved.

Both Cuddalore and Porto Novo were formerly places of considerable trade, of which but little now remains. There can be no doubt that if the harbours are improved, and if the communications between those places and the interior of the country is opened, as we have endeavoured strongly to urge that it should be universally, the commerce of both places will again become large. In the year ending 31st July 1850, the number of vessels that visited Cuddalore was 167, with a tonnage

tonnage of 11,806 tons; and the number visiting Porto Novo was 162, measuring 8,040 tons.*

Cochin harbour; its great natural advantages.

446. The next place which we will mention is Cochin, which next to Coringa, is by far the most important harbour under this Presidency. Cochin is situated at the outlet of a river, within the mouth of which is an extensive basin, having a depth of from 24 to 42 feet, and connected with backwaters and inlets, which give it the means of inland navigation in three directions; viz., southward to Quilon 80 miles, northward to Chowghaut 50 miles, and eastward or directly inland, 30 miles. We have already noticed that a project for connecting these backwaters with those of Malabar, by a cut 15 miles in length, and to cost only *Rs.* 8,995, was disallowed by the Government in 1849. That work, whenever carried into effect, will extend the water communication of Cochin northward to a distance of 130 miles. Thus, this place is admirably fitted to become an emporium of trade, the centre of a fertile country, with an extensive inland water communication, and immediately contiguous to the teak forests of the Annamalay Hills, full of some of the finest timber in the world. Even now its trade is not inconsiderable: in the year ending 31st July 1850, it was visited by 421 vessels paying port dues, having an aggregate measurement of 33,841 tons; and the vessels exempt from port dues were about equal in number and tonnage.

The vicinity of the forests also especially adapts Cochin to ship-building, and it has even already gained a considerable business of that kind. Ships of 700 to 800 tons are frequently built there, and vessels measuring as much as 1,000 tons have been launched, though vessels of this large size cannot easily be got over the bar, even when entirely empty. Lastly, it is excellently situated as a port of shelter in the south-west monsoon. At present there is not a single port of shelter in the south-west monsoon, between Cape Comorin and Bombay, and the vast importance of forming such an harbour has long been felt; that of Cochin is admirably suited to meet this want.

The water on the bar ought to be deepened.

447. The value of the port is very much diminished however by the shallowness of the water on the bar: and it is there that the chief improvement is required. The discharge of water during freshes in the river is so great, and even at other times the ebb tide is so strong from the great extent of the inner basin, that the horse-shoe bank usually found at the entrance of Indian rivers, is a mile and a quarter out at sea, where there is no more than 15 feet at low water in the deepest channel; and at present, consequently, few vessels enter the basin exceeding 250 or 300 tons, except for repair. The bar and the whole harbour have recently been carefully examined by Lieut. Selby, of the Indian Navy, and he has given it as his decided opinion that by means of dredging, a channel may easily be formed and kept always open across the bar, to 19 or 20 feet; and this with a rise of tide of from three to four feet, would enable vessels of a large draught of water to enter the basin. Hitherto nothing has been done to improve this very important port, and it is earnestly to be desired that it should no longer be neglected.

Abundance of stock can always be got at Cochin at a reasonable rate, and the only drawback is the want of good water, which cannot be obtained nearer than 21 miles distant. At no remote time it may be worth while to bring the source of this necessary article nearer to the port. Up to a very recent period the master attendant monopolized the privilege of supplying water to the shipping, and charged an enormous price for it; this very objectionable practice has now been properly prohibited by the Marine Board, and it is to be hoped that the prohibition will be strictly enforced.

Madras roads; a breakwater and a pier required.

448. Madras itself, as is well known, has no harbour or shelter for vessels of any burden, but merely an open roadstead. The anchorage is good, and vessels lie there

* As an example of the great importance of taking advantage of and improving the existing facilities for water carriage, we may quote the conveyance of granite from Trichinopoly to Tranquebar, for the construction of groins on the sea beach. The distance between the two places in a direct line, is 78 miles; by the windings of the river, it is probably 100. The stone was conveyed in basket boats on the river, by contract, at the rate of *Rs.* 3. 2. a ton, being 6 pice per ton per mile on the distance travelled, and 7$\frac{4}{5}$ pice per ton per mile on the direct distance. By land carriage it is very improbable that the cost would have been less than 3 annas a ton, and the actual charge on the direct distance was little more than one-fifth of that. And yet the water carriage was effected under the very great disadvantages of a river entirely unimproved, and of a species of boat almost the worst adapted of any ever invented for the conveyance of heavy commodities.

there securely except in the case of those very violent gales which occur every three or four years, at the commencement of either the S. W. or the N. E. monsoon. At such times it is usual for European vessels, being duly warned by the barometer, to put to sea; but still wrecks are not unfrequent, with melancholy loss both of life and property; and the coasting craft are often lost in great numbers. Various plans have been brought forward both for constructing a breakwater to shelter the anchorage, and for a pier to facilitate the communication between the shore and the shipping, but hitherto nothing has been done. There is no doubt, however, that both projects are quite feasible and at a cost insignificant in comparison with the advantages; and it is much to be desired that they should be effected, either by private enterprise or under the auspices of the Government. The trade of the port is fully sufficient to justify such an undertaking, and there is no doubt of its increasing with the progress of those improvements in the internal communications of the country, which we have advocated. In the year ending 31 July 1850, the number of vessels that paid port dues at Madras was 1,253, with an aggregate burden of 2,13,687 tons; the amount of the port dues was *Rs.* 36,762. 3. 2.

The improvement of the ports is very important.

449. We have noticed these few cases as instances of what is required; and we believe, that if carefully examined, very many of the ports all along the coast will be found susceptible of improvement at a moderate cost. Of late years something has been done in the way of lighting ports and the coast, but the lights are still very deficient in number, and almost all of them of an inferior description. The little that we have said is sufficient to justify the statement that the very important object of facilitating trade and navigation by improving the harbours, has been more neglected and been regarded in a more contracted point of view than even the irrigation works and the roads; we trust that a change may now take place in the disposition of the Government towards this subject. The prosperity of the revenue is in fact very intimately involved in it. The connexion of Government with the question is not by any means limited to the amount of the port dues, or even of the customs duties; the whole land revenue will feel the influence of measures calculated to remove disabilities from commerce.

A special fund for that purpose exists.

It is the more singular that so little has been done in the way of improving the ports, because a special fund exists for lighting and otherwise improving them, and that actually contributed by the trade itself. Act 13, of 1839, which consolidated the port dues at Madras, and provided for the consolidation of those at the outports, materially increased the rates in both cases; and the additional revenue secured by these enhanced rates was to be laid out in improvements. In point of fact, however, the expenditures have been very small, and exactly the same unwillingness to incur outlay on improvements has been displayed, as seen in the cases of Coringa and Negapatam above spoken of, as if the money had been to come out of the Government exchequer, instead of from a fund specially contributed for this very object by the trading classes.

Its origin and present amount.

450. The Act above specified came into operation at Madras on the 1st August 1839, but it was not extended to the outports till the 1st August 1845, after being tried during the interval at the Presidency, and found to answer well. All the surplus accruing under the new rates, in excess of the average yearly collection in the three years immediately preceding the introduction of the Act in each case, was to be devoted, in the words of the Honourable Court, to "the construction of lighthouses, and affording other facilities to navigation" (Despatch, 13 May 1840). We find, from tables obtained from the Marine Board, that up to the end of the year 1850–51, such surplus receipts amounted to *Rs.* 1,90,296. 8. 8., while the sum expended on improvements was no more than *Rs.* 27,351. 1. 2., leaving an unexpended fund of *Rs.* 1,62,945. 7. 6.

This fund ought to be used instead of lying idle in the Treasury.

Under the pressing necessity that exists not only for the improvement of the harbours, but even to arrest their decay, it appears most undesirable that this fund should thus be suffered to accumulate. We beg strongly to recommend that it should be laid out without delay in the measures most urgently required at the various ports of the coast; among which those proposed by Colonel Cotton for immediate adoption at Cocanada and Coringa, and the trifling expenditure refused by Government to Negapatam, ought undoubtedly to have a place. But for the permanent improvement of the ports, we would earnestly advocate the general adoption of the plan proposed by Colonel Cotton; viz., that of raising a capital for the improvement on the security of the port dues; by which means the measures so urgently required would be effected with the aid of the skill and educated judgment

judgment which only the officers of Government can supply, but without any charge to the Government.

The native commercial classes would pay higher port charges to obtain such improvements.

451. The merchants and shipowners of the various ports are quite awake to the necessity of stopping the injurious action of natural agents, and removing existing inconveniences; and, as exemplified in the case of both Coringa and Negapatam, we believe that they would universally be found cordially willing to pay an increased rate of port charges, if that should be found necessary to secure the required funds. And undoubtedly they are wise, because, as already observed with reference to the roads, the very improvements themselves will, as their natural result, repay their cost. For, to take only one single instance; we have mentioned above that the bank in front of Coringa has extended so far, that it always takes a boat one whole day, or at times two or three days, to make one trip to a ship in the anchorage; now if the expenditure of a few thousand rupees would have the effect, as there appears no doubt it would, of reducing this time to two or three hours, who does not see that this saving of time and expense would provide ample funds to pay additional port charges?

But they are unable to act without assistance.

But though willing to contribute in this very effectual way to the improvement of their harbours, these people are powerless to carry out such improvements themselves. They have but little capital, and that little is fully employed in their own legitimate callings; they are wholly unaccustomed to act in combination in such undertakings, and they have not the necessary confidence in each other; nor can they command the skill necessary both to devise and to superintend such works, which, as we have already observed, is possessed by the officers of Government alone. It cannot be doubted that the revenue will gain largely by these measures; and on every account it is proper that the Government should not stand aloof from this important class of operations, but should give assistance; that assistance involving no expenditure, but consisting simply in raising money on the security of the port dues (already devoted to local objects) and in giving the counsel and advice of their Engineer officers.

There ought to be some established system for the conservation and improvement of the ports.

452. There are a few other points which we will notice before quitting this subject. The first is the absence of any fixed system in dealing with plans for improving the ports. Measures connected with the lighting and providing buoys, seem all to come through the Marine Board; but of the propositions for clearing obstructions from the harbours, &c. only a few come up to that Board, and the greater part of those that have come up hitherto have reached the Government through the Board of Revenue, without the cognizance of the Marine Board at all; this appears decidedly objectionable. The Marine Board controls the Port Establishments, and alone receives returns of the shipping, port dues, &c., and that Board is almost necessarily better qualified than any other Presidency authority, to judge of the merit of any improvement proposed. We think, therefore, that although such work is executed at present under the direction of the Public Works Department of the Board of Revenue, and will be so hereafter under that of the Board of Public Works, yet that the opinion of the Marine Board ought invariably to be obtained on all projects of improvement to the ports; had this been done in the cases of Cocanada and Negapatam above referred to, the existence of a large sum of money specially available for such improvements would no doubt have been brought to notice, and Government would probably have been saved from refusing aid for want of local contributions, when there was at the very time a fund in the hands of the Government itself, contributed by the classes concerned for the very purpose in view.

The Marine Board should make an annual report to Government.

We would also suggest that the Marine Board should be required to report annually to Government on all the ports under this Presidency, noticing their condition as to the accommodation they afford to shipping; their state, whether improving or deteriorating; the amount of their trade; the improvements of which they may be susceptible; the result of past expenditure, &c. The Board might also be properly required to keep an account of all expenditures connected with the ports, as well as of all receipts and returns for expenditure in any shape, and lay both before Government with their annual report.

The emoluments of the Master Attendants are too small.

453. Another point which we wish to notice is the very niggardly scale of the allowances of the Master Attendants. At places like Coringa and Cochin, with an active and increasing trade, much must depend on the efficiency of the Master Attendant's Department, and if that officer himself is an active and energetic man,

he may be the means of very much good; but the present salary of only *Rs.* 105 a month, is quite insufficient to command such qualities. The constant resort of European shipping to the port, not less than the other requirements of the office, makes it absolutely necessary that the Master Attendant should be a European; but a competent man of that class cannot be expected for so small a salary. It was the inadequate amount of his salary which drove the Master Attendant at Cochin to the objectionable means of augmenting his emoluments, to which we have adverted above. Some time ago the Madras Government recommended to the Government of India that the salary of the Master Attendant at Coringa should be raised to *Rs.* 200 a month, the amount already paid at Tuticorin; to this application no answer appears to have been yet received. Even *Rs.* 200 appears inadequate; and the increase ought not to be confined to Coringa, but should be extended to the other ports having Master Attendants; viz., Masulipatam, Cochin and Tellicherry. If the officers holding the appointment of Master Attendant were made efficient, they might be usefully employed in various ways in connexion with the interests of navigation; they might make accurate observations as to tides, winds, storms, and changes in the form of the coast, or of the banks in or near the harbours, and keep registers of all such phenomena; they might also survey the harbours and coasts contiguous to their stations, draw up sailing directions from time to time, examine and report on pilots, &c. In 1837, the Marine Establishments at most of the out-ports were reduced almost to nothing; it may well be considered whether the interests of commerce, and therefore those of the Government also, as involved in them, do not require that those establishments should now be increased. Tuticorin, with a trade of 14,000 tons annually, has a Master Attendant; but Cannanore, with 22,000 tons, Negapatam, with 30,000 tons, Calicut, with 34,000 tons, Mangalore, with 38,000, and Coompta, with 45,000 tons, have no Master Attendants, and generally only one or two Lascars to attend to the lights. It may be thought good economy to dispense with Marine Establishments at all these and other places; but we are persuaded that it is so no otherwise than it would be to abolish all Collectors of Revenue. Such an opinion emanates from the same feeling on which we have already remarked when speaking of "Superintendence," which looks at the mere out-going only, and takes no enlarged view of the services obtained in return.

Legal power for the regulation of the ports is required.

454. Another important requisite is, that proper officers should be vested with power to prevent and to punish wilful injury to any port or anchorage, and to enforce the removal of obstacles, such as sunken vessels, &c. At the present time there is no authority competent even to prevent a vessel from emptying ballast in a harbour or roadstead, except at the single port of Madras. In the extract quoted above in para. 428, reference is made to two heaps of ballast thrown over by some vessel in the Coringa roads and the mouth of Godavery, and forming serious obstacles to navigation; there is no officer empowered to prevent such offence, or to enforce the removal of the nuisance, and it is probable that acts of this kind may have contributed in no small degree to the shallowing of many of the harbours.

The attempts of the Madras Government to obtain such power.

The history of the endeavours made by the Madras Government to obtain power to prevent such offences, well exemplifies the mode in which the interests of this Presidency suffer from their state of dependence on a distant and indifferent authority. On the 25th October 1842, the Madras Government sent up to Calcutta a draft of an Act for preventing and punishing the throwing over of ballast in the inner harbour of Mangalore. The Government of India objected to such partial legislation; and ultimately it was resolved to extend the Act to other ports, and on the 31st May 1843, a list of those to which it ought to be extended was sent up to Calcutta. In November 1848, the attention of the Government was recalled to the subject by a letter from the Marine Board, bringing to notice the necessity of putting a stop to the dangerous and injurious practice of throwing over stone ballast in the harbour of Tuticorin. The Government forwarded the papers to Calcutta, and requested that the proposed Act might be passed as speedily as possible. In November 1849, the same evil was again pressingly brought before Government; and on the 4th December the Government of Bengal was again requested to hasten the enactment; on the 4th April 1851, this request was urged a third time, and lastly on the 10th February 1852, and all without any effect.

The Act then applied for was defective.

455. Thus the draft of this law, which appears to be simple and easy to decide upon, has been before the Government at Calcutta above nine years and a half; and

and four times since it was first sent up it has been pressed on their attention as urgently required; and yet, up to the present time, not only has the Act not been passed, but we believe not a single word of reply or acknowledgment has been elicited.* We may observe that the draft Act appears to us defective. It specifies certain ports where it is to be applicable; but the inconvenience of this restriction is proved by the fact, that within a very few years (viz. in 1848), it was necessary to add the names of two other ports to those first proposed, viz., Tuticorin and Tranquebar; it would surely be better to make the Act general, and to empower the Madras Government to declare, from time to time, to what ports it should apply.

So also it is not sufficient merely to forbid the throwing over of ballast, there are various other things which need to be prevented or enforced in a well-regulated port. It seems highly desirable that a general Act should be passed, empowering the Madras Government to enact bye-laws for the regulation of the ports and the navigation, under the sanction of penalties to be defined in such general Act. This power is possessed by every little corporation in England, and appears essential to good order here; with an increasing trade the present absence of the power of control would be found intolerable, and probably a careful inquiry would exhibit no small amount of evil and of obstruction to trade, as its consequence even now.

Measures should be taken for preventing encroachments and unlawful appropriations of land at the various ports.

456. It is necessary also that proper measures should be taken for preserving the ports and basins and navigable rivers from encroachment and obstruction of all kinds. The limits of the ports should be defined, and the space adjacent to be kept free from private appropriation should be marked out. The ground necessary or likely to be eventually necessary, for the construction of wharves, docks, jetties, &c., should be reserved to the public; and no one should be allowed to acquire a private interest in such spots; at least not by mere occupation or prescription, or without a deliberate grant or cession by the Government. When trade increases, as there is every hope that it will do if the existing impediments to locomotion and transport of goods are removed, land in such a situation will become valuable, and parties will be constantly on the watch, according to the universal practice in this country, to exercise rights of ownership over portions of it, and so establish a title. Not only must it be declared that titles so founded are and will be invalid, but strict watch must be kept up against the very commencement of encroachment; otherwise much trouble and difficulty will be encountered.

The ports are inadequately provided with boats, &c.

The last point that we will notice, is that some of the ports are inadequately provided with boats and other means of assisting ships. Lieutenant Selby mentions that even at Cochin the Master Attendant has no boat capable of taking out an anchor; and that in the attempt to take one to a ship that had grounded in April last, in two of the largest boats of the place, the whole party would have been lost but for the assistance which he was able to render.

The Paumbam Channel.

457. Though not coming under the term port, we will here briefly notice the Paumbam Channel and the improvements effected in it, because the result shows conclusively that measures for facilitating intercourse are not thrown away in this country. The Paumbam Channel is the principal of the passages through the line of rocks and sand banks which connects the island of Ceylon with the main land; and for the purposes of commerce the only passage. It avoids the sand banks, and passes through the solid rock barrier. In 1829, the passage and the adjoining localities were closely examined by Major Sim of the Engineers, with a view to the improvement of the channel, agreeably to a recommendation to that effect which had been made by the Marine Board. It was a point for consideration whether the operations should be directed to the deepening of the existing channel, or whether an entirely new cut should be made through the spit of land which juts out from the main land. The former course was resolved on; it was that which promised the more immediate results; though for its full completion likely to be more tedious than the other. In 1836, the Honourable Court approved the decision; and an officer was then placed in charge of the work, and active operations commenced.

458. In

* The above is not the only instance afforded by the records of the Marine Board of such indifference to Madras concerns. In August 1849, this Government sent up to Calcutta, draft of an Act for regulating the pilots in the Paumbam Channel; and later in the same year another draft Act, drawn up at the suggestion of the Supreme Government, for the regulation of emigrant vessels. No notice appears to have been yet taken of either of these subjects, though three years have elapsed.

Improvement effected in it.

458. In 1828, the channel contained obstructions, having no more than five and a half feet of water over them at high tide, and except in the finest weather, no vessel drawing more than four or four and a half feet attempted the passage. The operations have continued from 1836 to the present time; they have consisted partly in blasting the rock under water, and partly in dredging a passage through the horse-shoe bank opposite the southern entrance of the passage. The present state of the channel is as follows: the passage through the rocky ridge is now 200 feet broad, and of that width 100 feet is 10 deep at low-water spring tides, except in a few parts where it shallows to 8½ feet; the channel over the bank has been dredged to 10 feet deep, and shows no tendency to fill up. The tide rises 2½ to 3½ feet, and vessels drawing 10 feet water now pass through the opening without difficulty. The total expenditure on the work up to the 30th April 1851, including the cost of the dredge, was about *Rs.* 1,53,000; and it was then computed that it would require a period of two and a half years, and a further outlay of *Rs.* 12,000, to complete the Northern Channel, viz., that through the ridge, to a depth of 10 feet throughout at low-water spring tides.

The results.

459. The results of this improvement are highly satisfactory: in 1834 the total tonnage passing was only 30,000 tons; in 1851, it was 1,68,282 tons, being an increase of five and a half fold in 17 years, and the progress was nearly steady throughout the whole period. And even this does not by any means fully represent the whole increase; for in 1834, the cotton of Tinnevelly passed through the channel, being taken to Madras in dhonies, and there screwed and shipped; now there are cotton screws at Tuticorin, and the cotton is shipped direct from that port for the foreign market, and does not go through the Paumbam passage at all.

And concurrently with the increase of tonnage, a gratifying change has taken place in the construction of the coasting craft; the awkward dhonies having been in a great measure superseded by square rigged vessels. In 1834, the only vessels that passed were 738 dhonies; in 1851, there were 959 dhonies, and 1,092 square rigged vessels. Between 1839 (the first year for which we have detailed accounts) and 1851, there is a material decrease in the former class, viz., from 1,148 to 959; while the latter had increased in number from 195 to 1,092, and in tonnage from 10,728 to 111,398 tons. These results of both kinds are a very gratifying proof that the natives of this country are not so backward to avail themselves of improvement or to adopt beneficial changes, as they are sometimes represented; and they afford strong encouragement to the universal improvement of the means of communication. A native pilot establishment is maintained at Paumbam, and a pilotage fee is levied, of which one-fourth is paid to the pilot employed, and the remainder goes to Government. The amount of pilotage fees in 1849 was *Rs.* 7,921. 6.

The Report of the Marine Board.

In their general report of the 3d October 1848, the Marine Board describe these results in the following terms: "As a natural sequence to these extensive improvements, the trade through the Paumbam Channel has gradually acquired a vigour which has, in the course of 13 years, more than quadrupled its former amount, and the annexed statement not only exhibits the progressive increase in the quantity of tonnage passing through, but shows that a superior description of vessel is being thereby brought into action. As long as the passage from the Coromandel to the Malabar coast, on the west side of Ceylon, was confined to one voyage in the year, the dhoney, a very frail description of craft, was in general favour as being less expense, and as easily sailed with a fair wind as any other; but now that the communication renders the passage practicable at all seasons, this is giving way to the more substantial brig and schooner, able to work down the gulf of Manaar against the south west monsoon, a feat which 50 years back few English ships would attempt. These are built by natives at Cochin, Negapatam and Nagpore; most are of teak, and many of them coppered, and being generally commanded and manned by natives, afford an interesting specimen of their advance in the science of navigation."

Estimate of the value of the increased traffic in figures.

460. We will endeavour to give some idea in figures of the value of this increased traffic, viz., 1,68,000 in 1851 against 30,000 in 1834, or 1,38,000 tons increase. The traffic is between Madras and other ports north of the passage on the one hand, and Ceylon, Tinnevelly and the Western Coast on the other. A very large part of it is between Columbo, in Ceylon, and Negapatam in Tanjore. If we take the average distance passed over at 300 miles, a very moderate estimate, the cost of freight, calculated

calculated at three pice per ton per geographical mile, will be about *Rs.* 4 ¾ a ton, and allowing that one-fourth of the whole tonnage is without freight, it will give *Rs.* 5,30,000 per annum as the amount annually paid for freight. Now it is certain that the value of this transit must be much more than this amount, as goods are of course not moved unless there is a profit upon moving them. We therefore know that the advantage obtained by the community from this trade cannot be less, but that it must be much more, than 5 ½ lacs a year. Of the advantage of conveying the goods at different seasons, when they could not be moved in the former state of the pass, of course it is impossible to estimate the value in figures, but it must be immense. To convey 1,38,000 tons of goods 300 miles by land in the present state of the communications, would cost fully 77 lacs. The sum expended in improving the passage, including the steam dredge, has been 1 ½ lacs; and the charge upon the state is thus only *Rs.* 7,500 a year, being the interest of the capital expended, for a benefit to the community of certainly much more than five lacs and a third annually.

Section VIII.

Proposed Scheme of Expenditure on Works of Irrigation and Communication.

The expenditure on public works has been increased of late years;

461. In the foregoing two Sections of this Report it has been our endeavour to show that expenditure by Government on Public Works is not profitless waste, but that whether it be directed to the extension and maintenance of irrigation, or to the effective improvement of the means of communication, the outlay is abundantly returned, directly in the former case, more indirectly in the latter, and with enormous profit. This is opposed to the view practically acted upon by the Government; for though the ruling powers recognize in general terms the policy, and perhaps even in some degree the duty, of undertaking such improvement, yet with a few noble and magnificent exceptions, they have always been most grudgingly conceded, in this Presidency at least.

We cheerfully acknowledge indeed that a material change in the views taken of this important subject has gradually supervened, and that compared with the earlier times of British rule the policy is now liberal. We have seen that in the early parts of the present century the roads were utterly neglected, and that, so late as 1831, a deliberate resolution was recorded by the Government, withdrawing from all further attempts at amending the wretched communications of the country; while now we have a sum of four lacs a year set apart for the maintenance and improvement of the principal lines, and sums not inconsiderable in themselves have been granted for other roads. Again, as to irrigation works: in the early times of our power these were totally neglected; by slow degrees, and after a very heavy sacrifice both of Government revenue and private property for many years, the value of these works came to be more justly appreciated; the expenditure upon them, and the attention paid to them have therefore gradually increased, and quite recently two magnificent works have been undertaken, viz., the anicuts on the Rivers Godavery and Kistnah, and the systems of channels and other works in connexion with them.

But is still far too small.

462. All this improvement we fully admit; but at the same time we feel compelled to maintain that the outlay even now is petty, compared with the object and the opportunity. The splendid instances which we have quoted are only exceptional; the general tone of feeling in the Government is still narrow; there is still the same confined view of the field of operations: still the same feeling, clearly apparent, though not avowed, that every outlay is an evil, no matter what and how great is the benefit to be so secured; still there is the narrowest and strictest economy in refusing trifling outgoings from the Treasury, combined with the same practical disbelief, as of old, in those general truths which point to the sure means of vastly augmenting the income.

It has been our endeavour to combat such views; to show that the expenditure both on irrigation works and on roads has been and still is far too small, and that, as a consequence, the revenue has suffered, and the advancement of the country been greatly retarded; and by setting forth the actual results of those cases of improvement of both kinds, in which a more active course has been adopted, to show how truly wise a more liberal expenditure would be.

We now proceed, according to our plan already announced, to state the amount which a careful consideration of the circumstances of the country leads us to propose for the annual expenditure both on works of irrigation and on roads.

Proposed expenditure in maintaining the works of irrigation.

463. We will first consider the amount proper to be annually devoted to the maintenance and improvement of irrigation works. The revenue actually received by Government from land irrigated by the Government works amounts to 135 lacs of rupees yearly; and that alienated in the form of land situated under Government irrigation works, granted on rent free tenure, the irrigation of which the Government is bound to maintain as much as if the revenue were actually payable to itself, may be taken at about 15 lacs, making a total of 150 lacs yearly; and it seems unquestionable that if the existing works were kept in full efficiency, the revenue from them would be materially higher. The sum now expended annually on their repair and maintenance is about seven lacs of rupees; but this is certainly too little now. It would probably be sufficient if the works were once brought into good order; but notoriously, and on the evidence adduced above, they are in general much out of repair, and a considerable expenditure is required to bring them to a proper point of efficiency, so as to yield a maximum return. Supposing it to be resolved, as on every account we trust it will be, that the works are to be efficiently repaired, the question as to the amount to be annually expended on that object is one of time as to the results, and of capability of spending the money to advantage. Looking at the whole subject, considering the other works to be undertaken, the means of superintendence likely to be available, and the quantity of labour to be obtained, we would propose 15 lacs yearly as the usual expenditure in maintaining existing works, and bringing them into an efficient condition, including the furnishing them with proper sluices and calingulahs, improving their sources of supply, and other minor and ordinary improvements.

Fifteen lacs of rupees steadily laid out every year on these objects, under able and judicious direction, would soon produce a marked effect. On the one hand the revenue from the works would increase; and on the other the works thus put in good order would require very little annual repair, and the charge on that account would thus progressively decrease. This proposed expenditure would be 10 per cent. on the present revenue from irrigation; but this rate would be gradually reduced as the effect of the improvement became apparent, and as the whole number of works in efficient repair became larger year by year; and when all shall have been brought into that condition, the cost of keeping them in order will be much less.

The tank fees.

464. In connexion with this part of the subject we may here briefly advert to the "tank fees." It has been usual to regard the cost of maintaining the works of irrigation, as a charge on the revenue; and it has even been represented as a part of the cost of collecting the revenue.* It cannot be included in the latter without a perversion of language and confusion of ideas; and it is certain that it is not even a charge on the revenue to the extent commonly supposed; and it is doubtful whether it is so at all.

The native princes who constructed the tanks and channels of irrigation, knew quite well that from their very nature they must stand in need of constant repair. They

* Among the Papers printed by order of the Committee of the House of Commons, on East India Affairs, in 1851, is a Minute by Mr. H. T. Prinsep, on the finances of India, dated in November 1842. At page 40 is a table, purporting to show the charges of administering the land revenue under each of the four Governments of Bengal, Agra, Madras and Bombay. In each of these four cases, the charges include large sums for one or more of the following items; viz., pensions, poolbundy, revenue surveys, canal charges, or tank repairs. Under Bengal, Agra and Bombay, all those charges are classed as miscellaneous, and there is a note carefully stating the amount of each of those items; under Madras, on the other hand, not only the similar charges, viz., those for pensions and tank repairs, are placed under the head of "Native Deputy Collectors," instead of under "Miscellaneous;" but there is not a word of explanation to show their amount or their real character; on the contrary, the large amount of the charge just shown, under the head of "Native Deputy Collectors," is expressly, though most erroneously, asserted by the writer to be owing to the "Ryotwar settlements and system introduced by Sir Thomas Munro;" and the fact is wholly overlooked that the large amounts of pension and tank repairs (about *Rs.* 9,50,000) are no more properly a part of the charges of collection at Madras than the similar items so carefully excepted at the other Presidencies. Under the present arrangement of the supreme controlling authority, this most erroneous and injurious statement went home to the Honourable Court, without opportunity to any Madras officer to correct it; and, from its being now brought forward without correction or qualification, it has probably been received as truth throughout the last 10 years, and down to the present time.

They therefore made a special provision for this necessity, by subjecting every acre of land irrigated to a special cess for this particular purpose, which was in some instances contributed by the Ryots, and in others in equal parts from the Ryots' share and the Government share of the produce, the revenue being in those times received in kind. We have not the means of determining whether this constitution of things was universal in all the provinces now forming this Presidency; but it certainly prevailed generally throughout many of those in which irrigation is the most common, and it was probably universal all over the Carnatic at least.

After the assumption of the government by the English, it was determined to consolidate all the items, making up the land revenue into a single demand, and for the most part this was a fixed sum in money for each acre or each cawny, the revenue in kind being commuted. In that operation the tank cess was included in the settlement, and was merged in the revenue; and the correlative duty of maintaining the works of irrigation in efficiency was fully recognized on the part of the Government. The only exception to this arrangement, we believe, was Tinnevelly, where, though the tank cess was commuted into money, and the proceeds included in the general revenue, a separate account of its amount has always been kept.

Those fees are paid to the Government on the express condition that the works shall be kept in good repair.

465. These facts place the Government in a new position as to the works of irrigation. It now appears that these works are not by any means generally maintained out of the state revenue. As regards a large proportion of them, the Government are in the position of trustees of a special fund, contributed wholly or in part by the holders of irrigated land, over and above, and independently of the Government rent of the land, which latter was at first actually, and still is, theoretically, a certain proportion of the year's produce for the maintenance of those works, originally constructed at the cost of the Government, by which the additional value was given to their property. Or even granting that Government may be regarded as having contracted to maintain the works in consideration of these fees, and so as not responsible for the unexpended amount, even then the condition of their title to the money is that they shall keep the works in good repair. It thus appears that it is not simply a question of policy whether the Government shall keep the works in repair, nor even that there is a merely implied engagement to do so; but that it is a positive and express obligation to be fulfilled in return for an equivalent received. It must be admitted that this duty has not been performed, and private property has suffered great damage in consequence; and it now remains, therefore, to retrieve past neglect, and bring up the works into a state of full efficiency as rapidly as possible.

We have adverted to the fees, to show that it is by no means universally true that the Government revenue bears the charge of maintaining the irrigation works; but even if it did, there are valid grounds for urging the complete performance of the task. For, independently of the direct and express obligation, there are two other inducing motives: 1st, the fact that capital has been invested in the irrigated land on the faith of the irrigation, involves a moral obligation to maintain it; and 2d, even if that obligation were disregarded, the motive of self-interest would still remain; for we have adduced many facts in our Sixth Section to show how intimately the prosperity of the revenue is connected with the efficient condition of the works of irrigation. And in this respect, this Presidency differs from almost every other part of India, for every improvement or extension of irrigation here, adds to the revenue by what may be called a natural process; while Poolbundy, and some other similar expenditures elsewhere, though incumbent in fulfilment of obligations, and perhaps necessary to the permanent maintenance of the existing revenue, can never add anything to its amount.

Proposed expenditure in extending irrigation by new works.

466. We propose, then, that 15 lacs a year should be devoted to the restoration and maintenance of the existing works; and the next question is, what sum should be applied to the formation of new works; for, on every account, irrigation ought to be extended. And this question again involves the same considerations as the former one; viz., that of time as to the results and of the means of laying out money to advantage. There is no want of profitable projects to be undertaken; we have mentioned a few, but they do not by any means constitute the whole, or even perhaps the most important. In every district there are favourable openings for such undertakings, and they will be brought forward rapidly as soon as officers shall be available for the important duty of investigation, and the Government shall manifest a disposition to receive such proposals with favour. Looking at the same

considerations as in the former case, we would propose that at least seven-and-a-half lacs annually should be devoted to the object of extending the benefits of irrigation; but while proposing this as the usual annual expenditure, we must express our opinion that it would be inexpedient to adhere to the limit too rigidly; latitude should be allowed when any important projects are brought forward, and when there appears reason to believe that more works can be executed. Nothing is gained in such cases by delay, it is only postponing the results, which, on the contrary, ought to be realized as soon as possible. It will be desirable, also, that to a certain extent, at least, the unexpended allowance of one year should be considered as available for succeeding years. This is necessary, indeed, to prevent confusion; it is impossible to determine precisely, beforehand, how much will be spent in any given year out of the amount sanctioned.

Classification and extent of the roads required.

467. Thus the whole ordinary and usual sum proposed to be spent yearly on works of irrigation is 22 ½ lacs of rupees. We have next to consider what will be a proper amount of expenditure on the communications of the country.

Roads may naturally be divided into three classes: viz., first, the main arteries, such as we have described in the preceding section, which we there proposed to consist of three kinds, viz., those running inland from the coast, those parallel with the coast, and those connecting important posts and places in the interior; and which we have already stated at 7,700 miles, or we may say 8,000 miles. Second, roads connecting towns of inferior importance with each other and with the main lines, and connecting the chief stations of districts with the chief towns of the Talooks, and the chief Talook towns of different districts with each other, where contiguous. We have not the means of stating the probable requirement in this class with any accuracy, but we are not overstating them in fixing them at 20,000 miles. Third, the village roads connecting villages with the towns, or with roads of the first and second classes. It is impossible to state what length will be wanted of roads of this class; it will increase very much with the progress of improvement. But as this Presidency contains 138,279 square miles, with a population of 160 to the square mile, and numbers about 56,000 villages, it cannot require less than 150,000 miles of these village roads.

Comparison with the extent of roads and canals in England.

468. The lengths of road here set down, may appear startling to many who have not much considered the subject; and it seems proper, therefore, to offer some remarks in justification of what we propose, before proceeding further. We will compare the proposed length with that actually existing in England, the only country of which we have the necessary statistics at hand.

We find from M'Culloch's statistical account, that England and Wales contain above 23,000 miles of turnpike-road, and 104,000 miles of cross roads and other highways, besides 2,400 miles of canals, and navigable rivers to about the same extent; and, in addition to all this, about 5,000 miles of railways. Even putting aside the railways, we have thus, in the turnpike-roads and inland navigation, 28,000 miles of internal communication, which may be regarded as corresponding to the roads of the first and second classes proposed by us, though in fact very greatly superior to them.

England and Wales contain an area of 57,812 square miles, and, by the Census of 1851, a population of 17,922,768 persons, being 310 to a square mile; the Madras territories measure 138,279 square miles, and, according to the Census also taken in 1851, have a population of 22,281,572, being 161 to the square mile. It is certain that equal areas require more or fewer roads in proportion to the density of their population; but it is also true, that equal populations require more or fewer roads in proportion to the greater or less area of the country which they occupy; and it cannot be considered extravagant to require for this country an extent of main lines of communication, no greater than is found in a country only two-fifths of this in extent, and inhabited by a people less numerous by one-fifth.

Extent of village or cross roads required.

469. The roads which we propose under the name of village or cross roads, may be compared with the "cross roads and other highways" of England, though in truth immeasurably inferior to them, and, indeed, not deserving the name of road at all at present. England having 104,000 miles of such roads, it seems far from exorbitant, in sketching out a plan for internal communications, to assign to this country, with its great extent and scattered population, 150,000 miles of such roads. We know well that there is a great difference between projection and fruition, and that, in the nature of things, it must take many years to create a system of internal

internal communications for a vast country; but we are anxious that at least the realities of the case should be recognized, and that even a beginning should be made in the work. And when we contrast such accounts as the following of the state of the communications in parts of our own country at no very remote period, with their condition now, we are led to hope that a similar period of change may be about commencing in this country also:—

"In Arthur Young's 'Tour in the North of England,' published in 1770, he gives the following description of the turnpike-road between Preston and Wigan, a spot which is now become a centre for railway operations:—'I know not, in the whole range of language, terms sufficiently expressive to describe this infernal road. To look over a map, and perceive that it is a principal one, not only to some towns, but even whole counties, one would naturally conclude it to be at least decent; but let me most seriously caution all travellers, who may accidentally purpose to travel this terrible country, to avoid it as they would the devil, for a thousand to one but they break their necks or their limbs by overthrows or breakings down. They will here meet with ruts, which I actually measured, four feet deep, and floating with mud, only from a wet summer; what, therefore, must it be after a winter? The only mending it receives in places, is the tumbling in some loose stones, which serve no other purpose but jolting a carriage in the most intolerable manner. These are not merely opinions, but facts; for I actually passed three carts broken down in these 18 miles of execrable memory.'"—Porter's Progress of the Nation, p. 296.

"It is not easy for those accustomed to travel along the smooth and level roads by which every part of Scotland is now intersected, to form any accurate idea of the difficulties the traveller had to encounter in that country a century ago. Roads were then hardly formed; and, in summer, not unfrequently consisted of the bottoms of rivulets. Down to the middle of last century, most part of the goods conveyed from place to place in Scotland, at least where the distances were not very great, were carried, not by carts or wagons, but on horseback. Oatmeal, coals, turf, and even straw and hay, were conveyed in this way! At that period, and for long previously, single-horse traffickers (cadgers) regularly plied between different places, supplying the inhabitants with such articles as were then most in demand, as salt, fish, poultry, eggs, earthenware, &c.; these were usually conveyed in sacks or baskets, suspended one on each side the horse. But in carrying goods between distant places, it was necessary to employ a cart, as all that a horse could carry on his back was not sufficient to defray the cost of a long journey. The time that the carriers (for such was the name given to those that used carts) usually required to perform their journeys seems now almost incredible. The common carrier from Selkirk to Edinburgh, 38 miles distant, required a fortnight for his journey between the two places, going and returning! The road originally was among the most perilous in the whole country; a considerable extent of it lay in the bottom of that district called Galawater, from the name of the principal stream, the channel of the water being, when not flooded, the track chosen, as the most level and easiest to travel in!"—M'Culloch's Account of the British Empire, vol. II., pages 53 and 54.

470. As we propose that the village roads shall be made by the people, we will say no more of them at present, but confine ourselves to the first two classes of roads; and the cost of those may be computed as follows:— Cost of the first and second class roads.

		Rs.
	First-Class Lines.	
8,000	6,800 miles first-class road, at *Rs.* 3,500	238,00,000
	1,200 miles of coast canal and back-water improvements, at *Rs.* 3,000	36,00,000
	Total First Class	*Rs.* 274,00,000
	Second-Class Lines.	
	20,000 miles, at *Rs.* 2,500	500,00,000
	Total First and Second Class	*Rs.* 774,00,000

That is 7,750,000 *l.* sterling as the cost of forming a system of main roads and canals

canals for a country 2 ½ times the size of England and Wales, and with a population larger by one-fourth. The amount may seem large when looked at by itself, but as the means of attaining an object so vast and so valuable, it must be regarded as quite insignificant. In order to show this more clearly, we will compare the probable performances of both these classes of roads with the cost of the same amount of work on the common unmade roads. We will assume that the average traffic to the mile on the former is 200 tons a day, or 70,000 tons a year, being less than three-fourths of that now actually borne on the Western Trunk Road, though it is almost without branches or feeders; and that the average on the second class will be 30,000 tons a mile annually. The comparison will then be as follows:—

Comparison of their performances with those of the common roads.

First-Class Roads.

	Annas.	*Rs.*
8,000 + 70,000 + 1½ =	- - - - -	525,00,000

Second-Class Roads.

20,000 + 30,000 + 1½ = - - - - -	562,50,000
Total - - -	*Rs.* 1,087,50,000
Interest of capital - - - - - - -	46,40,000
Cost of repair - - - - - - -	80,00,000
Grand Total - -	*Rs.* 1,213,90,000

Common Roads.

8,000 + 70,000 + 3 = - - - - -	1,050,00,000
20,000 + 30,000 + 3 = - - - - -	1,125,00,000
Total - - -	*Rs.* 2,175,00,000
Difference or saving - - - -	961,10,000

Proposed expenditure on roads.

471. Thus we have in every year a net saving in the cost of carriage, after deducting all surcharges, to the amount of above 960 lacs of rupees, or nearly 10,000,000 *l.* sterling, being a much larger gain in each year than the whole capital laid out in forming the roads, or more than cent. per cent. profit to the community. We are not so sanguine, however, as to expect that this great work can be accomplished within a short period; under any circumstances it must be a work of time, and more particularly in the actual condition of this country, and when the whole has to be effected by the agency of the Government. We are only anxious to point out what there is to be done, and to urge that now at length the task should be entered upon with vigour. With this view we propose that, as a beginning, 20 lacs annually should be steadily expended on the communications, in improving the roads already existing, and in opening new lines; and though this sum seems large, and is truly very much beyond anything ever proposed before, yet we cannot think that any one, duly considering the case, will think it a larger sacrifice on the part of Government, if we can justly regard it as a sacrifice at all, than is required by true wisdom. And large as it seems, it will be many years at this rate before the scanty system of communications which we have sketched out will be completed.

The cost of maintaining the roads.

472. But, besides the cost of formation, it must be remembered that a considerable amount will be required annually for the repair and maintenance of roads. On those of the first class, on which it may be supposed that the traffic will be heavy, probably on an average 70,000 tons a year, the cost of repair cannot be assumed at less than *Rs.* 500 a mile, so that every 100 miles of such road constructed will cost half a lac of rupees annually to maintain; on the second-class roads, with a lighter traffic, suppose 30,000 tons a year, the average cost of the annual repair may be taken at *Rs.* 200 a mile. And if it be thought that these charges appear enormous and exorbitant, let it be remembered that the cost of maintenance varies very exactly as the traffic, so that the larger that item is, the more

more valuable has been the road; and we have shown, in the preceding section, that the value of the use of a good road exceeds, manifold, the cost of maintaining it.*

Hitherto the maintenance of the made roads, so far as they have been maintained at all, has been defrayed by the Government, with trifling exception, and no immediate change in that respect need be made. But when there shall be a large extent of such road that cost will be very heavy; and it will be necessary to consider whether the charge shall continue to fall on the general revenue, or shall be met in any degree by tolls.

A good road will very well bear a toll.

473. There is no doubt that a good road provides ample funds for the payment of a toll; this will be evident by a reference to the note to the preceding paragraph, or to the account which we have given above (para. 151) of the reduction of the cost of carriage on the High Western Road. It is seen in the latter that since the Road Department was formed, the cost of transporting goods has fallen about 50 per cent., so that a toll nearly equal to the present hire of a cart might be paid, and yet leave the trader all the benefit of that increased speed, safety, and certainty, which the improved condition of the road ensures. But, in point of fact, a very much lower toll would provide for the maintenance of the road; for the amount of that reduction in the cost of transport, on the 100,000 tons annually carried on the road, comes to the enormous sum of nearly seven lacs of rupees a year; whereas it is computed that if once put in good order, *Rs.* 40,000 a year would be sufficient to maintain the whole line in its present degree of repair, being only 1-17th of the actual money gain by the road. And taking even the rate of $1\frac{1}{2}$ pice per ton per mile, which the experience of the Agra Trunk Road has found sufficient to maintain a road in perfect order, the cost of maintaining 125 miles for a traffic of 100,000 tons would be only *Rs.* 97,625, or less than one-seventh of even the present gain in carriage; and that gain, as shown above in para. 423, would be more than proportionately increased by the improvement effected in the surface of the road.

Objections made to tolls in this country.

474. But though it is thus indubitable that tolls might be easily paid for the use of roads, many people are opposed to this mode of providing for their maintenance, from the fear that any power to levy a toll would be made a plea for exaction, and that with the known habitual submission of the people of this country to official oppression, and the assumed difficulty and distance of redress, much more than the authorized amount would be extorted. No doubt there is some ground for this apprehension; and especially so if it is true, as we have reason to believe, that even on the Colombo and Candy road, where there is so much traffic in which Europeans are directly concerned, the tolls are not fairly taken, but exaction is submitted to in order to avoid detention. But even allowing that such a danger exists, we do not think that it is sufficient reason for abandoning the idea of introducing tolls. It seems fair and natural that the repair of roads should be paid for by those who use them, and we believe that the people of this country would pay a toll cheerfully for the use of a good road; and we say this the more confidently, as we have reason to believe, that in Ceylon not only the tolls are willingly paid, but the Poll-tax, so obnoxious at first, is now popular, because it is known that the proceeds are devoted to the formation of roads. Even coupled with a degree of abuse and exaction, we are decidedly of opinion that the introduction of tolls would be an advantage;

They appear, nevertheless, to be expedient and beneficial.

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* This may easily be shown in figures as follows, taking 20 miles of made and of unmade road:—

Cost of carrying 70,000 tons in a year 20 miles on a first-class road.

	Rs.
Interest on the cost of making 20 miles (*Rs.* 70,000) - - - - - =	3,500
Repairs for one year, at *Rs.* 500 a mile - - - - - - - - =	10,000
Cost of carrying 70,000 tons 20 miles, at $1\frac{1}{2}$ anna per ton per mile - - -	1,31,250
Total - - -	1,44,750
Cost of carrying 70,000 tons 20 miles, on an unmade road, at 3 annas a ton a mile	2,62,500
Difference - - -	1,17,750

Thus there is a clear gain of much above a lac of rupees every year on only this short extent of 20 miles, in a single year; but this does not by any means express the whole effects of the improvement, because it leaves out of sight the great effect of the reduced cost in increasing traffic.

A comparison with the 2d class made road with the unmade would exhibit similar results, but we need not detail it.

advantage; and the danger of such exaction would be reduced to a minimum, by placing the toll-bars only in the vicinity of places where complaints of misconduct could be speedily heard and redressed; and, by having the rates as few and simple as possible, together with the usual precaution of having them publicly notified at every tolling station. For a different reason, those stations which must be few, should be placed where they cannot be easily evaded. On the whole, we are of opinion, that eventually tolls may very properly be made the means of raising funds for keeping made roads in repair; but it is obviously necessary, that before a toll is laid on any road, that road should be placed in first rate order, so that the payers may see at once that they get a full value for their money. Tolls should also be introduced gradually; and for many years to come, and until the extent of roads to be maintained has become very much larger than it is at present, the Government may well be content to bear a large part of the charge of maintaining them. But there seems no good reason why, ultimately, the roads should not pay for their own maintenance in this country as in others; it is to be confidently hoped that in the course of time that characteristic of the people which we have adverted to, as considered by some persons to be a sufficient argument against tolls, will disappear, and that they will learn to resist exaction.

The cart tax in Salem.

475. We may here notice the bandy tax, or tax on carts, existing in the Salem district, the proceeds of which are devoted to the repair of the roads. The origin of that tax, so to call it, is singular. In 1836, Mr. Orr, Principal Collector of the district, who, as already noticed, had interested himself much in the improvement of the roads, forwarded to Government an address which had been delivered to him for that purpose, being a petition from certain bandy maistries and others, praying, that as the roads of the district had been improved, they might also be preserved in repair, and proffering a contribution of one rupee a year for each of their carts, to form a fund for that object; and begging that the Principal Collector might be empowered to collect and receive the amount and lay it out on the repair of the roads, publishing an account of the receipts and expenditure in the Fort Saint George Gazette at the end of each year. It may be doubted how far this petition emanated from the free motion of the parties themselves, and at all events they were very few in number; but its prayer was agreed to by the Government, and the Principal Collector was authorized to receive "voluntary" contributions at the rate specified, "from the cart-owners and maistries of the district." In almost all the proceedings of Government and of the Board of Revenue on this subject for a number of years, the term used for these payments is "subscription" or "contribution;" and in 1839, on a reference from Mr. Gleig, the new Principal Collector, the Board expressly declare their opinion, that being based on a voluntary offer, the demand could not be enforced by distraint. There are other indirect means, however, of enforcement or influence, and practically the voluntary character of this payment seems to have been soon lost sight of. We learn from Mr. Lockhart's letter to the Board of the 31st January 1846, that all "regular carts" (meaning apparently all those with spoke wheels) throughout the district were "assessed" at one rupee each; and the demand was made by the same agents, and in the same mode as demands for the Moturpha or the land revenue. And in the same letter the unpaid "balance" is reported on in the same terms that would be used of an arrear of any species of revenue. In the same letter, also, the Collector, though describing the "tax" as voluntary, recommends that a like "tax" should be levied on the "wudder bandies," or carts on solid wheels, of which he states there were then 2,000 in the Northern Talooks of the district. It is observable, also, that out of *Rs.* 762. 2. the uncollected balance of these "contributions," *Rs.* 710. 10., was due by the Government servants of the Collector's Cutcherry and the Zillah Court, or by Europeans; *i. e.* by classes not capable of being influenced to pay, by the same means which would be effective with the people generally.

It is willingly paid.

476. It seems certain, then, that this payment must be regarded now as a tax, and not as a voluntary contribution; but at the same time it seems to be one that is paid willingly, and it is creditable to the people of Salem that it is so. In October 1845, some cart-owners addressed a petition to the Board of Revenue complaining that they were subjected to a "road-tax" as they styled it, of one rupee a year on each bandy, and praying that it might be abolished. The Collector having been called upon for an explanation, detailed, in the letter already referred to, the origin of the "tax," and stated that it had been paid without objection as long as Mr. Orr remained in the district, because he had always applied the proceeds to their proper object, but that discontent had arisen because Mr. Gleig had carried a part of them

to

to the general revenue; he added his opinion that if the original and proper practice were restored, there would be no further complaints of the tax. This was at once conceded by the Government, and the amount diverted from the repair of the roads by Mr. Gleig (viz. *Rs.* 5,184) was immediately disbursed; and there have been no expressions of discontent since.

The Government ordered, at the same time, in accordance with the Collector's recommendation, that the contribution or tax should be levied on the "wudder bandies" as well as on those of the better construction.

But it is insignificant in amount, inferior to a toll, and partial; and ought to be abolished.

477. The amount of the tax in 1836 was *Rs.* 1,185; in 1850 it was *Rs.* 4,222; the increase was gradual, being probably due partly to an increase in the number of carts, partly to increased exactness in collecting the tax, and partly to its extension to the solid wheel carts in 1846, which year showed an advance of nearly *Rs.* 1,200 above 1845. The amount cannot be materially augmented; it will increase indeed as roads are more extensively made, and carts consequently come more into use, but then the demands on the fund will be largely augmented also.

The tax has been useful as affording a small fund at the unfettered disposal of the local authorities; but it is utterly insignificant as a resource for keeping up the roads of a district 8,000 square miles in extent, or even for maintaining the 400 miles which already exist. If regarded as a tax it is inferior to tolls as a means of raising funds for roads, and in proportion to its amount is fully as liable to abuse and evasion as a toll need be; and if really made a voluntary contribution, it must be uncertain and variable. As existing at present it is partial, being confined to one district only; the measures which we propose will render it superfluous, and we beg to recommend that it should be abolished.

Railways and canals.

478. In our sketch of the lines of communication to be formed by Government, we have said nothing of railroads, and have only casually adverted to canals. Our object was chiefly to point out what must be looked to as the great lines of traffic, and not to indicate the species of communication to be adopted. But the same course of argument which proves that a perfectly made road is the cheapest, with even so small a traffic as 3,000 tons a year, will be equally effective to prove that when the traffic is somewhat greater, suppose where it is 50,000 or 60,000 tons a year, a railway will be cheaper than a first-rate common road; and this even supposing that the actual traffic was to remain stationary, whereas universal experience shows that it would vastly increase with the creation of such improved means. On such lines, then, railways should be constructed, either by Government or by private enterprise, and with a single or a double line according to circumstances. Again, as to canals; we have noticed that on the greater part of the coast line a canal capable of navigation by steam can be constructed at a cost little exceeding that of a first class road, while it is undoubtedly a very superior instrument of transport. Here, then, such canals should certainly be formed; and, even in the interior situations will be found in which, irrigation and navigation being combined, a canal will be even cheaper than a road; while, though undoubtedly greatly inferior to a railway, a canal would also cost very much less, and might be worked much more cheaply.

We merely throw out these suggestions. The object should be, to provide in each locality that species of communication which is there the cheapest on the whole, and reckoning not simply the nominal cost of conveyance, but also the difference in risk of damage and in delay. The determination of these points requires careful local inquiries, both as to the amount of traffic actual and to be reasonably expected, and as to the nature of the face of the country; and these inquiries require the special attention of professional officers, unencumbered with other duties.

A road ought not to be determined upon for any line till it has been subjected to such investigation, to ascertain the best direction to take, and the best species of communication to be adopted. And as such inquiries necessarily occupy much time, we would earnestly press on the Government the expediency of commencing them without delay, as far as the present very limited number of Engineer officers makes practicable, and especially with the view of opening roads from the Eastern coast into the interior.

The village or cross roads must be made and maintained by the people.

479. Before leaving the subject of roads, we will briefly revert to the village or cross roads, though it is not our proposal that these should be constructed or maintained by the Government. By this term, as already explained, we intend those

those local communications which will be necessary to connect the villages lying at a distance from the main lines, with those lines or with the chief towns of talooks. Of these roads, we suppose that a length of 150,000 miles will be required to complete the communications of the country; the total number of villages, exclusively of the small Presidency district, is about 56,000, giving an average of 2 $\frac{2}{3}$ miles of road to each village. It appears no hardship whatever to oblige the people to make and maintain these roads; the case is quite different from that of requiring them to make the main lines. There they would be giving their labour for the benefit of travellers from distant countries more than for their own; while here, those who make a road will gain by it chiefly, if not almost exclusively. It is true that the Government will also benefit by these roads, for no improvement in the communications of the country can take place without operating on the revenue; but the Government charge themselves with the formation and maintenance of the main lines. In almost all civilized countries the people are under an obligation to maintain the cross roads within their respective villages; and it may probably be said, that wherever the roads of the country at large, the roads of the people, as distinguished from the imperial lines or the roads of the Government, have attained to any degree of excellence or utility, it has been under the operation of this rule. Indeed, it does not appear how these roads could be brought into existence by any other agency. The Government could not effect it: it is usual to expect everything from Government, in this country especially; but daily observation shows that there are many things which a Government cannot do, and many others which it cannot do so well as an individual or an association of individuals. The Government of Madras is charged, indeed, with the maintenance of all the multifarious works of irrigation, and we have seen in some degree how it has performed the duty. We hope for improvement in that respect hereafter; but even if it is attained, that would be no good reason for undertaking the additional charge of all the village roads. The Government succeeded to the charge of the one, and a change of system, even if deemed expedient, might be difficult; but it would be a different thing to assume voluntarily the charge of the still more difficult work of constructing and maintaining 150,000 miles of road, in 56,000 villages, and over 138,000 square miles of territory. And as this is not a work for the Government, so also it is one which could not be undertaken by private speculation; and no other agency remains, except that of the village communities themselves.

The duty will be willingly performed.

480. And though the duty is a new one in this country, yet we fully believe that it is one which will be willingly discharged when it is demonstrated to the people to be for their interest, by the actual operation of the main roads in their neighbourhood; and when they see that from the want of a communication between their own village and such main thoroughfares they are at a disadvantage when compared with neighbouring villages contiguous to the main line. Under such circumstances, their first step no doubt will be to apply to the Government officers to make a road to their villages; but when it shall be pointed out to them, in reply, that the Government make the main lines, and leave the village roads to be made by the village people, we feel sure that they will cheerfully acquiesce in the reasonableness of the rule, and follow the course to which their own interest points; and the example once set, will speedily find imitation.

But it will need to be regulated, and to be enforced on the indolent.

But, as in other countries, so it will be here, the obligation will require to be regulated and enforced by law, so as to compel all the individuals of a community to do an equal share; for the active and industrious will not consent to work, when the idle do nothing, and yet share the benefit on equal terms with them. It will, therefore, be necessary to declare the obligation, and to give power to the Collector to enforce it; and his exertions and influence will also be often called for in bringing parties into harmony when a road has to be made by the joint exertions of the people of several villages. The aid of the Engineer Department should also be freely given in the selection and the laying out of lines. And it will likewise be necessary to prescribe the width of these village roads, and to give power to insist on that width being preserved.

In this work, as on the main lines, a beginning may be made very speedily; but it will necessarily be many years before a general system of such communication can be formed; and it may be expected that not only the standard of excellence in these roads will gradually rise, as the people become more enlightened and more aware of their value, but that the machinery for their management will improve

improve also. Thus, at first every landholder will give his own or his servant's labour; but, in the course of time, the example may be followed of levying tolls as on the main lines, and officers and bodies may be specially nominated for the management of these roads.

Total proposed expenditure on Public Works.

481. To return to the subject of the Government expenditure on public improvements. We propose an outlay of 22 ½ lacs annually on works of irrigation, and 20 lacs on roads; the expenditure on Government buildings is about four lacs and a quarter, and we see no occasion to recommend any special augmentation of that expenditure, what is wanted in the way of repairs being rather promptitude than increased outlay. We may observe, however, that the improvement of the barracks of European troops now at last commenced, will somewhat raise the expenditure on new buildings. The total may be taken at about 48 lacs,* and the present expenditure in the same branches being about 19 lacs,† on the average of the last five years, the increase proposed is about 29 lacs. A considerable increase will also be necessary in the Engineering Establishments. We have already spoken of the present injurious and wasteful deficiency in that part of the Government service; and in pursuing the subject we shall, in the following section, give a detail of the establishment, which appears to us the lowest that true economy requires. The cost will amount to about 14 lacs and three-quarters, including all grades and all classes, as well as an institution for educating and training the subordinates; and as the expense of the present very inefficient establishments, as nearly as we can compute it, is about 5 lacs and 80,000 rupees (*see* Appendix IIH.), the increase here will be nearly nine lacs. Thus the total increase proposed is 38 lacs annually.

From what sources that expenditure should be supplied.

482. We are well aware that this will be deemed a very large sum; but after the most careful consideration of the circumstances of the case, we can come to no other conclusion than that this is the very lowest that ought to be fixed as the usual expenditure, and we will not shrink from clearly stating that conviction. It is now to be considered how this expenditure can best be met; from what sources the funds for it can be most properly and most economically provided. All who have followed us through the preceding parts of this Report, and have concurred in the conclusions stated respectively in the last two sections, based as they are on actual recorded facts, will readily agree with us in the sure conviction that the expenditure itself will speedily create funds in a rapidly increasing revenue. But we shall for the present put aside that expectation, and we also discard altogether the idea of imposing fresh taxation to meet the outgoing; a course which, if attempted on the necessary scale, would undoubtedly prove suicidal. The question, then, is simply this; whether the expenditure shall be from revenue only, or whether funds shall be raised for the purpose by loan; whether the advantage to be taken of the unparalleled and hitherto neglected openings for improvement presented, shall be limited to a small part of the surplus revenue of the country, or whether use shall be made of that good credit which the Government enjoys, to secure the benefits of the works in anticipation; whether we shall defer these works till the necessary capital can be slowly accumulated from the ordinary resources of the Government, or whether we shall borrow funds for their formation, thus making them pay for themselves, without any expenditure or even advance of money on the part of Government; whether, lastly, the generation of the present day shall pay for these works by which all future generations will so largely benefit, or whether the cost shall be shared between the present and the future.

The real surplus revenue of Madras is larger than the accounts shown:

483. And here we would observe in the first place, that in the examination of the public accounts into which our inquiries have led us, we have been brought to the opinion that the surplus revenue of this Presidency when fairly computed, *i. e.* the surplus over its own expenditure, or over the expenditures of the territories of which

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* We do not mention the improvement of the ports among the expenditures to be incurred, because, as we have pointed out, they will themselves so obviously provide funds for the work.

† | | Rs.
---|---
Appendix (V.)—Irrigation Works - - - - | 10,37,393
Appendix (W.)—Roads and Bridges - - - - | 4,20,762
Appendix (X.)—Government Buildings - - - | 4,29,491
Total - - - | 18,87,646

which it receives the revenue, is much larger than appears under the present mode of making up the imperial accounts. Madras is required to contribute 50 lacs annually, as its quota of the home charges; and this amount of contribution has very rarely been reached. Great efforts have consequently been made by the Madras Government, under constant and urgent injunctions from Bengal, to effect reduction in their expenditure; and it cannot be doubted that one main cause why the sums expended in this Presidency on works of public improvement have always been so small in comparison with similar expenditure in other parts of the empire, has been this constant demand for saving, and the anxiety of the Madras Government to avoid such unpleasant communications.

Because the debits include the charges of territories, of which the revenues are credited to other Presidencies.

484. And yet all this time the real surplus of this Presidency, fairly calculated, was very much in excess of what had been fixed by the Honourable Court, and so rigidly insisted on by the Government at Calcutta. We find by the accounts printed every year by order of the House of Commons, that the charges borne by the Madras Revenue include the cost of garrisoning extensive countries, the whole revenue from which, under whatever name received, is paid into the treasury of other Presidencies; thus the Saugor and Nerbudda territory in Central India, Cuttack and Balasore on the east coast, the Southern Mahratta country, the Tenasserim Provinces in the Eastern Peninsula, the settlements in the Straits of Singapore, and the little principality of Coorg in South India, are all supplied with troops by Madras, and the garrison of Mhow, in the Indore State, and the subsidiary force at Nagpore are also furnished by the same army; and yet this Government obtains credit for no part of the revenue of all the territories occupied, or of the revenue and subsidy for the maintenance of the two latter forces, the whole being paid to Bengal, except the revenue of the Southern Mahratta country, which is received by Bombay. Now, as nearly as we can compute it, from the best information at our command, the whole amount of revenue, and the subsidy from these various countries is fully 119 lacs of rupees, and the annual cost of the troops occupying them is not less than 75 lacs, which is paid out of the Madras revenues, and not from the revenues of those countries themselves.

It seems no more than fair that whatever treasury receives the revenue of a territory, the same should bear all the charges of the management of that territory, and if this rule were adopted, Madras would be seen to have a surplus of 75 lacs of rupees yearly, in excess of that which is shown under the present system of arranging the imperial accounts. It must be admitted indeed, that Madras is bound to bear a share of those charges of protection from foreign aggression which, from local position, must fall more immediately on other parts of the empire, as well as of other charges required alike by the interests of every portion of it; this should be fairly apportioned, and it would no doubt reduce the surplus above specified; but it would then have also to be remembered, that in addition to the expenses above mentioned, Madras already contributes nearly seven lacs of rupees a year to such general objects, viz., in maintaining the garrison of Aden.

But the expenditure on Public Works ought not to be measured by the yearly surplus revenue.

485. But whether the present surplus of revenue over expenditure be large or small, we would contend against the principle of making the accidental amount of that surplus the measure of the expenditure on improvements morally certain to produce a large increase of revenue by the legitimate and really beneficial means of augmenting the comfort and the resources of the people; and further, we have already pointed out in the concluding part of our Sixth Section, that there are under this Presidency in excessive taxation and pernicious taxation, both unknown in other parts of the empire, depressing causes which ought to be removed in order to allow scope for the expansion of the industry and productive powers of the country. Both species of improvement are essentially required; to invest capital so as to facilitate production and interchange, and to abstain from taking so much in revenue, or from taking it so injudiciously as to overload and press down the productive resources and energies of the country; and the two ought to advance together, and they might be easily made to do so, if only our rulers would exhibit a real faith in those general principles which have not only been demonstrated by science, but have been practically proved by experiment in our own country.

A reference to the example of England.

486. In the commencement that has been made in the reform of the taxation of England, we have seen enormous sums of revenue given up year after year, in the sure and wise confidence that production and consumption relieved from those burdens, would speedily expand and make good the deficiency, and we have seen the

the expected result uniformly follow. Such a confident acting on general principles almost universally acknowledged, we are anxious to see in the administration of this country. It may be said that the cases are different, because there it was only giving up a surplus, while our proposal is to create a deficiency to be supplied by borrowing; but this difference is only one of circumstance arising from the different condition of the two countries, the substantial points of the two cases are the same. Can we suppose that the same far-seeing wisdom and moral courage which largely reduced taxation, and yet promised that the revenue should not fall short, would have hesitated to resort to a loan for the development of the same creative power, if it had been necessary, and if the same reasonings existing in the actual case had supported the expectation that a return of 20 or 30 per cent. might be secured by a payment of 5 per cent.

Now we have already shown, that under the extraordinary natural advantages of this Presidency on the one hand, advantages which in its existing social position no other body than the Government can make use of, and on the other, the extremely cheap and economical and utilitarian mode of constructing all public works, which has happily become the established habit and custom in this Presidency, irrigation works may largely be formed to yield 30, 40, 60 and even 100 per cent. net annual profit in direct revenue, and that the actual gain by making roads, in the only instance wherein the improvement has been sufficiently decided to give precise results, has exceeded 20 per cent. direct return in revenue on the sum expended; and such being the case, the profits to be obtained being so large and so certain, it evidently appears the part of true wisdom to raise capital for these objects by loans, when it can be largely obtained on such easy terms as five per cent.

To borrow capital for such objects would be truly economical.

487. Hitherto indeed the very idea of raising loans for ordinary peace expenditure has been regarded as a thing not to be thought of, and properly so with respect to the usual kinds of Government expenditure, which are mere outgoings, without any expectation or possibility of material return: but the case is different with respect to loans for public improvements, and the same rule cannot be applied to this case without confounding things essentially different; there is no analogy between a debt incurred for the construction of a work morally certain to return a large profit, and a debt for the prosecution of a war, which is a mere sinking of capital; yet the two are often thoughtlessly classed together. We are far from denying that a war may be necessary, or that to borrow money for prosecuting it may be wise and right; but there is obviously an essential difference between raising a loan for such a purpose, and for works which, besides returning a large profit to Government, will be the means of enriching and adding to the comfort of millions; such a debt cannot be regarded at all as a burden on the finances, because it is morally certain that the investment of the sum borrowed will create a fund for its repayment within a short period; it more resembles a guarantee to a railway company, with this important difference however, that the latter may involve loss, but cannot yield profit; while the former holds out sure promise of large profit.

Good credit, as the fruit of stability and good faith, is one of the advantages enjoyed by a good Government over a bad one; a Government which possesses it and fails to make use of it, willingly surrenders one of the most important advantages resulting from its position and character. People do not act thus in private life. A merchant values his credit as a part of his capital; it stands to him indeed in the place of capital, and if judiciously employed, equally yields a profit. A merchant importing goods, draws a bill against them at three or six months' sight, thus borrowing the value of the goods and his profit upon them; and a man would be thought insane who abstained from doing so from a morbid dread of being in debt. All that we ask is, that the Government should adopt the same rules of action as those which commonly guide prudent men in the transaction of their own private affairs.

The sum fixed for public works should be provided if necessary by loans.

488. On the foregoing considerations, we would beg strongly to urge that the sum fixed as proper to be annually expended on public works should be so expended without consideration of the current surplus revenue; that the amount should be considered as no less necessary to be provided, and no less an essential part of the year's expenditure, than the pay of the army or the interest of the debt; and that any deficiency in the year's revenue to meet the charge should be made good by loans. And such loans, we would add, need not even nominally form a permanent

burden on the finances, but may be accompanied in every case by provisions for their gradual liquidation; either annuities for terms of years might be granted, or, which would perhaps be better, the increase obtained from the particular works, in the case of irrigation, or from the particular tracts or districts affected, in the case of roads, might be devoted to the liquidation of the debt as the primary security, the general revenue to be of course the ultimate security in case that first should fail. It would also be highly desirable that such loans should be raised, not in India only, but in England also; by that means two advantages would be gained,—the loans would be obtained at a cheaper rate, and the deficient capital in this country would not be drawn away from other occupations.

Irrigation works and common roads must generally be undertaken by the Government.

489. The foregoing remarks are intended to refer primarily and chiefly to irrigation works and common roads, both of which will in general be most properly undertaken by the Government itself. The former for the most part involve rights and obligation already existing between the landholders and the Government, which would be complicated by the intervention of any third party; particular exceptional cases may be found where questions connected with such existing rights may be capable of adjustment to the satisfaction of all, and on a small scale parties would be found willing to invest their money in such improvements, if only Government should be willing to concede liberal terms to them; but in general such works must be undertaken by the Government. And as to common roads, they will not hold out sufficient inducement to attract private speculation. To enable them to do this, it would be necessary that heavy tolls should be imposed, sufficient not only to defray the cost of maintenance, but to pay a handsome dividend; certainly they would afford the means of doing this, but from the aversion of people to a heavy toll, its imposition would certainly operate to restrict traffic, and so to diminish not only the total receipts, but also the benefit from the road. The Government would receive its profit in the increase of the revenue of the tract affected by the road, but we do not apprehend that they would be willing to give up to any private company an interest in such indirect return.

Railways and canals by private enterprise.

490. But there are other species of internal communication, in which private speculation would find wide scope; we mean navigable canals and railways; in the former it might be employed partially, in the latter exclusively. There seems no room for doubt that railways would succeed well in this country, as they have actually been found to succeed in countries inferior in density of population and in the quantity of commodities to be exchanged. The surface of the country is peculiarly well adapted for them, being generally plain and the undulations very gradual, with a slight inclination on the whole from the interior towards the coast, the very direction in which there would be by far the heaviest traffic. Again, in this country the purchase of land would a most insignificant item in the cost, and of any charges corresponding to the legal and Parliamentary expenses so heavy in England, there would be scarcely anything at all. It would be necessary also to abandon the extravagant and magnificent ideas associated with railways in England, and rather to take those of America as a model. Doing that, working with the people to be found on the spot, only intermixing the European element sufficiently to employ their labour to the best advantage, and forbearing to make contracts in England with people who must have extra profit to come out, extra profit for learning the ways of the country, and extra profit to cover the risk of embarking in unknown enterprises, the cheapness of construction would be such as to surprise people acquainted only with the cost in England. At the present price of iron, a single line could be laid down, including all charges, for 2,500 *l.* a mile, and a double line for 4,000 *l.* It would be wise for Government to aid such undertakings as far as they legitimately could; and besides guaranteeing a certain per-centage of profit, they might take the initiative, after the manner of the French and other Governments, by fixing on lines to be constructed, and then offering the execution to private companies.

Navigable canals might be constructed very cheaply on some lines.

491. As to canals, we have already declared our opinion that, on the coast lines, canals of a capacity suited to steam navigation would be by far the best and cheapest species of communication; the cost of construction would be wonderfully little, and, from the almost entire absence of locks, the navigation would be liable to very little impediment; and the cost of carriage on such canals would be not only far less than on common roads, but much lower than anything that has been thought of for railways. On the Cochrane Canal, firewood, the chief commodity carried,

carried, and which requires no shelter, is conveyed at the rate of three pice a mile a ton; and this would certainly be reduced by better arrangements, and if the canal were in better repair; Major Pears proposes a rate of an anna a mile for the railway, and it is not likely that it will be under half an anna or six pice. In the interior, there may be other lines on which canals may be beneficially made, often in combination with irrigation. Here also the agency of private enterprise might be called in, as above suggested in the case of railways. We may add, that the canal just mentioned, the only one now existing under this Presidency that is regularly used for navigation, was formed by a private individual, and on the terms there suggested. It was planned on the part of Government, and was then given for execution to Mr. Basil Cochrane, who was to enjoy the whole proceeds for 45 years, and then to surrender the canal to Government; his interest in it was, in fact, bought by the Government while the term of his contract had still some years to run. (*See* Appendix (H.)

The amount devoted to public works should be at the disposal of the local Government.

492. In concluding this section, we will observe, that it appears to us a matter of the first importance that whatever sum is fixed as proper for the usual annual expenditure in this Presidency on public works, should be at the unfettered disposal of the local Government. That is the authority which must be supposed the best acquainted with the wants and interests of this portion of the empire, and the best able to judge of the wisest mode of employing a given amount devoted to public works. We cannot see that anything is gained by submitting detailed questions of local improvement to a distant power seated in Calcutta. That authority is wholly unacquainted with the internal wants and interests of this Presidency, and this ignorance naturally produces indifference. It is a natural law, that things engage attention in proportion to their nearness rather than to their real importance; and it is only a consequence of this natural law that the providing employment and food for half a million people, or the opening a river navigation of 400 miles length in the Presidency of Madras, is a matter of insignificance in Calcutta compared with any trifling local question. In point of fact, the judgment of the Council at Calcutta is based almost invariably on financial considerations; and it appears to us that this is the only aspect in which that body ought to have any acquaintance with projects of public improvement under this Government. Hitherto, however, such questions have been complicated by the fact that any improvement refused to this Presidency would by so much lessen the general expenditure; and the temptation thus held out, combined with the local feeling or absence of feeling above adverted to, has undoubtedly operated largely to restrict public improvements here, not simply in the refusal of projects sent up, but in preventing many from being sent up at all.

A prospective estimate to be prepared every year, for the information of the Government of India.

493. It is right and necessary, no doubt, that the general Government should control the whole expenditure of the empire. But all that is necessary to that end in this department, is that a total sum should be fixed for the expenditure in it; the distribution of that sum, and the selection of works to be undertaken, may be left to the local Government, without any infringement of the legitimate powers of the supreme controlling authority. The requirements of the case will be satisfied if the amount to be devoted to public works is previously known, in the same way as the amount required for the public official establishments is now known beforehand and duly provided for.

The fixing of a general standard for the public work expenditure will meet this rule to a certain extent, but not fully; because the actual expenditure will vary somewhat from year to year above or below the fixed standard. It is very desirable that the actual expenditure of every year should be ascertained beforehand, as nearly as circumstances admit, for the better information of the financial authorities. With this view, we propose that it shall be one duty of the Board of Public Works to prepare every year a budget or prospective estimate of the probable expenditure on public works of all kinds in each of the ensuing two years, specifying the amount required for each of the three branches of the department and for the several species of work. Such an estimate, of course, can be only approximate; it will be made chiefly with reference to the usual expenditure in former years (after a just standard of expenditure shall once have been attained), with additions or deductions for any special works or special circumstances. It should be made on a liberal scale, so that it may not be exceeded; but, of course, the estimate of one year may amend the still future part of the estimate of the preceding year.

When the estimate is within the amount of the standard which we propose should be determined for expenditure in this department, it will not need the sanction of superior authority; but having been approved by the Madras Government, will be communicated to the Government of India as the estimated expenditure to be provided for. When from any special cause it shall be in excess of the fixed standard, we propose that after having been approved by the Local Government, it shall be sent home for the confirmation of the Court of Directors; and having been so confirmed, shall be made known as before to the Government of India. It appears advisable, for the reasons already given, that the confirmation should rest with the Honourable Court rather than with the Government at Calcutta; and with the present rapid intercommunication between England and India, this course is not likely to produce either delay or any other inconvenience.

Section IX.

The Necessity of enlarging the Public Works Establishment in all its Grades, with a Statement of the New Establishment proposed; and with some Preliminary Remarks on "Superintendence."

Introduction.

494. We have thus, according to the plan sketched out at the beginning of our Fifth Section, stated the urgent necessity that exists for a larger expenditure both on works of irrigation and on roads, and the vast benefits which would accrue to both the Government and the people from the adoption of more enlarged and liberal views on this subject; we have also specified the annual amounts which, as it appears to us, ought to be devoted to the purposes of improvement in each of those two great divisions. We now proceed to consider the very important subject of the establishments required by true economy for the effective direction of the expenditure, and for the due preservation of the valuable works from time to time constructed; and after what we have already stated in various parts of our preceding remarks, as to the utter inadequacy of the existing establishments, we need hardly observe here that we shall have to propose a very considerable increase. In dealing with this subject, which we feel to be one of the most important of all those before us, we shall first offer a few considerations to show the necessity of materially enlarging the present establishment, and detail what appears to us to be required; and, secondly, we shall explain the means by which in our opinion the increased number of officers may best be obtained, and the training which appears best for each grade, European and native: the former of these divisions will form the present section, and the latter will occupy the following one.

The nature of "Superintendence."

495. Very erroneous ideas are entertained in some quarters on the subject of superintendence. The outlay on this account appears to be looked upon almost as so much money thrown away; at least it is evidently thought that rigid parsimony can nowhere be so wisely exercised as on this item; and that system of expenditure is thought to be the most economical which exhibits the smallest proportion of outlay on this account. This feeling—for we cannot but regard it as matter of sentiment and prejudice rather than of reason—stands on the very threshold as an obstacle to the improvement of defective establishments, to all attempts at more skilful and more economical modes of projecting and executing works, and to all measures for diminishing or extirpating fraudulent practices. We think it may, therefore, be useful to offer in this place a few brief remarks on the nature and uses of the several things commonly, and often unthinkingly, comprehended in the term "Superintendence," with the view of showing that a saving in this item is often extremely wasteful, and that to measure superintendence by the mere comparison of its cost with the expenditure on work is in every case fallacious.

The various things included in the term.

496. The term, as generally used, comprehends the following five distinct functions:—

1st. Projecting works, and making the necessary surveys, lines of levels and estimates.

2d. The inspection and check of work and accounts after completion.

3d. Directing rude labour, so as to render it most productive.

4th. Enforcing a fair day's work for a fair day's wages.

5th. Keeping such a watch over the condition of works as shall ensure their being maintained in a state of security and efficiency.

Now

Now of these five operations it is evident that the second and fifth only are superintendence as distinct from the actual cost of a work. The other three are in fact parts of that cost; they are contrivances for cheapening work, and in a degree are even essential conditions of the performance of work at all. We are persuaded that the jealousy with which any increase in the cost and amount of what is called superintendence is viewed, and the wish to diminish it, spring in great part from forgetfulness of its real character as a valuable and necessary means of cheapening work, securing good work, and preventing loss. And we will now show that in all these phases of superintendence, any inference from a comparison of the charges on this account, with the cost of the work, cannot but lead to error, no direct proportion existing between the two.

It cannot be judged of by comparison of cost.

497. Of the first description of superintendence, viz., the projection, &c. of works, it is evident that its cost, instead of being in proportion to the money spent, ought to be exactly in the inverse ratio, since the best engineering skill is that which produces the greatest results at the least cost. If a per-centage upon the outlay were taken as the criterion in this case, it is evident that the less able the engineer was, the higher would be the remuneration that he might claim. It would be like regulating the physician's fee by a per-centage on the apothecary's bill. As an illustration of the loss resulting from the want of skilled and experienced officers for this branch of duty, we beg to refer to the supposititious case put by Colonel Cotton in Appendix (F.) para. 12; which, though itself hypothetical, very aptly presents a large class of actual occurrences under our present system, with the important exception that in very many instances the plan of the inexperienced officer is not rectified but acted on. The very limited scale of our professional establishments compels the employment of young and inexperienced officers in the projection of works, who, as a necessary consequence, fail to see how the object aimed at may be most cheaply and most effectively attained. In short, our engineers are unavoidably put to actual work while they ought to be only under instruction, and they gradually acquire skill and experience by a succession of errors, of which the State bears the cost.

The projection of works.

498. Of the second, viz., the inspection of works, and check of accounts, there are positions in which it would not be so directly wrong to estimate this description of superintendence by the expenditure, as in the former case; but this would be most erroneous as regards the general works of the country, whether roads or irrigation works, because the labour of inspection depends, not so much on the sum spent, as on the facility of visiting the work. A ghaut or barrack, costing two lacs of rupees, can be inspected by one officer in two days, whereas the examination of the works of the ordinary estimate to that amount could hardly be done by the existing Civil Engineer Department of a division in as many years. It is evident, therefore, that the amount of the district bills will give no clue whatever to the labour expended in examining the works executed.

Inspection.

499. Of the third and fourth descriptions of superintendence, viz., directing work in progress, *i. e.* showing in what way work may be executed most cheaply as well as most effectively, and securing a fair amount of work from those employed, we need only instance the bridge at Bowany, to show why these kinds of superintendence cannot reasonably be estimated by a per-centage on the money laid out upon workmanship and material. The bridge was estimated to cost *Rs.* 48,725, but by the good superintendence it will cost above *Rs.* 5,000 less than that.* On the per-centage mode of calculating, the Overseer's pay, if correctly proportioned to the estimate, becomes exorbitant in consequence of the great saving which he effected; yet who will deny that his services were more meritorious and more valuable for the very reason of that saving; and who will fail to see, when the facts are thus put before them at least, that it would have been well worth while to give even *Rs.* 2,000 or *Rs.* 5,000 to this Overseer if it had been necessary, rather than pay *Rs.* 150 to a Maistry, who would have spent the whole amount of the estimate? The question of what sum it is advisable to pay for this kind of superintendence in India now is quite incapable of being answered satisfactorily: this only is certain, that

Directing rude labour and enforcing honest work.

* This is the actual amount; in Para. 47, it is stated at *Rs.* 14,000, which was the sum computed by the Engineer while the work was in progress, including, however, an oversight of *Rs.* 3,000. The Civil Engineer states that in this bridge the bricklayers laid each 1,000 bricks a day in the arch work, and 1,800 in the walls and spandrils, under the efficient superintendence of the Overseers.

that it should be far higher than it is in England. In the first place, because in all that portion of the work which is done by contract there, the charge for "Superintendence" (directing and overseeing the work-people) appears, as it ought here and every where, as a part of the cost of the work, and not distinct from it; in the second place, because the highly finished works of that country being far more expensive, both from the costliness of material, and the higher price of fine workmanship, the charge for building is raised, without any necessary increase of the charge for supervision.

More such superintendence necessary in India than in England.

500. And, even supposing that there were more similarity in these respects, a comparison could not be drawn, the countries being differently circumstanced in all particulars. The labourers in all branches of the builders' arts in almost all parts of the Madras Presidency are at the lowest point of skill as well as energy, and the superintendents must be teachers as well as managers. In England materials can be readily purchased at short notice of any quality, and at prices regulated by competition; whereas here, the superintendent has to become the manufacturer. There the meanest workman takes an interest in the work he is employed on, which is never found in India. Sir Francis Head points out the energy and devotion shown by the common excavator in cases of danger to the tunnel or embankment on which he is engaged, and every one must be struck on reading his papers with the comparatively helpless position of the Engineer in this country, from the inferior means at his disposal; all which disadvantage has to be balanced, as far as possible, by additional superintendence. There is not at this moment in the whole Madras Presidency, a really good and well shaped brick to be purchased; not one ingredient of any material used is well prepared; and the same description of tools are in use throughout the country with which the temples were built a thousand years ago. Even those labourers who work by contract, have not the energy to put their strength to what they are engaged in, whilst those who are employed on daily wages, work as though they considered it a duty to themselves to do no more than they can help. The money lost by apathy and want of skill, by bad materials, wrought with ill-formed tools, and by waste from wanton carelessness, even in the works best managed in the present day, is a far heavier per-centage on the outlay than has ever been paid for superintendence; and must be so, till we have introduced better apparatus for the manufacture of material, taught the use of modern tools, and by a general employment of Europeans, shown what energy can do when well applied. The sum that might be advantageously laid out in such improvements, cannot be fully estimated. Good bricks would reduce the thickness of walls, and well-shaped ones economise three-fourths of the time now used. Each well-taught bricklayer (as was actually the case on the Cauvery Bridge before mentioned) would lay three times the number of bricks in a day that is supposed possible by the most active native builder. In every portion of a work in progress, losses are occurring; and instead of now reducing the cost of superintendence, our true economy would be to have on all important works European teachers of every trade required on it. In large buildings we could hardly spend more in this way than would be at once repaid; but even if it caused an increase in the first expenditure, the saving by the knowledge gained, would well repay the cost whatever it might be.

Something must be allowed for experiments and for failures.

501. That little has been done to introduce improvements, may be attributed in some degree, to the too strict comparison of bills with estimates, but not less, to the smallness of the sum allowed for skilful "Superintendence." There has always been a rod held over the executive, who (as a natural consequence) have been deterred from spending money upon teachers, apparatus or experiments. The workmen of India are more decidedly opposed to change than any in the world, and when employed upon a novelty, failure is to them a species of success. We may quote a single instance to show the amount of intelligence possessed by the men on whom a Civil Engineer has to rely, to carry out his plans. A new calingula was under construction to the Govindavaudy Channel in the district of Chingleput; and, as the quantity of masonry work was large, the Civil Engineer, Captain Collyer, caused a mill to be set up for grinding mortar, to be worked by bullocks. On visiting the anicut while in progress, he found 12 men harnessed to the mill, and 12 women beating mortar in a trough in the usual Indian way; though if properly worked by bullocks, the mill would have supplied more than all the bricklayers employed could use. The cost of the 12 men was *Rs.* 45 a month, and of the 12 women *Rs.* $22\frac{1}{2}$, making a total of *Rs.* $67\frac{1}{2}$, whereas the hire

of

of two pair of bullocks with drivers, would have been only *Rs.* 14 a month. The mill was put up for *Rs.* 10, and would last many months; adding, however, *Rs.* 2 monthly on that account, here is a direct waste of *Rs.* 50 out of *Rs.* 67 ½ through the ignorance, indifference or determined opposition to improvement, shown by the native Maistry. In all countries the history of improvement in the mechanical arts, is a detail of failures, as well as of successes; the former are the most numerous, but the great successes, though comparatively few, vastly preponderate in value. Without experiment, there can be no improvement, but the very term experiment necessarily implies a risk of failure; self-interest, the great incentive to invention, is wanting to the servants of the Government in this country, nor is it merely a negative want: the Government make no acknowledgment of success either in money, honour or promotion, but in case of failure, the unfortunate experimentalist has not only to bear the loss, but to endure censure. Under these circumstances, improvement can come in only as it were by stealth, and if we would shut it out altogether, we have only to adopt the advice of those who would forbid expenditure on better skill by limiting the charge for it to a small per-centage on the outlay.

The custody of works.

502. The fifth description of superintendence is for keeping watch over the public works to prevent loss from their falling into a state of inefficiency; and by timely repairs to reduce to a minimum the cost of keeping them in order. We need hardly say that as the establishment for this purpose is reduced, the cost of repairs and loss will naturally increase; and if the allowance for superintendence is to be calculated by a per-centage upon anything, it should not be on the actual cost of repairs, but on the amount which would be necessary if there was no watch kept; or rather, as the amount lost from the works being in an efficient state is greater than any sum spent in repairs, we should also take that item into the calculation, and the per-centage should be upon the revenue risked, added to the saving to be effected by careful guard and timely repair.

We cannot specify the proper amount of superintendence.

503. From what we have said, we trust it will be seen, that the superintendence to which our attention has been called, has hitherto been estimated on a wrong principle; but in showing that, we are aware that we have not demonstrated what sum ought to be spent upon it; nor are we able to do so, but on the contrary we are prepared to say, that in the present state of things, no one could form a correct opinion on the subject. That the charge for superintendence was formerly much too low, is clearly seen by the advantages derived from the increase of late years. That it is so still, is equally capable of proof, and though we cannot say how great the further increase ought to be, we can, without difficulty, point out where a great further expenditure on that account would be advisable.

Much has been gained by the increase of superintendence, hitherto;

504. We have been unable to obtain any detailed statement of the cost of superintendence for a longer period than 10 years, during which its proportion to the amount of work done has not greatly varied; but what we have said in the early part of the second section as to the gradual growth of the department is sufficient to show how little was spent upon "superintendence" formerly. But what was the state of things in those times? We may find an example in the case of Cassy Chetty, detailed by the Commissioners of Inquiry into the Frauds in Coimbatore in 1816, and to be found in the revenue selections. We are there told that large sums were debited as laid out in repairs of tanks, and the most complete and unexceptionable accounts and vouchers for the expenditure systematically prepared, for a series of years, while throughout that time, no part of the money charged had been really so expended. This case, we fully believe, was exceptional in degree, but there is good reason to believe, that abuses similar in kind, prevailed throughout the country; and that they have now been reduced to a minimum is owing partly to the increased efficiency of the Collector's Department, but mainly to the activity of the Civil Engineer Establishment. The loss in those days, in a single year, by peculation, by neglected tanks, by money wasted in bad or ill-planned works, if summed up and brought into comparison with this year's cost of superintendence, would show such a balance in favour of the present system, as would induce a fair consideration of the present charge for superintendence, as compared with what it was. While to those who shall succeed to the management of affairs, the expenditure on superintendence now, will 30 years hence seem only a shade less foolishly impolitic, than the absence of all check in Cassy Chetty's day appears now to us.

505. Comparing

But the amount even now, is extremely small.

505. Comparing the present amount of superintendence with what it formerly was, it seems large; but when compared with the work to be done, and the immense extent of divisions, it would long ago, in any other country, have been acknowledged to be absurdly and preposterously small; for truly no other terms adequately describe the state of things at present. In speaking of the Engineer Department we have shown some instances of the losses that have been sustained for want of officers, and given some proofs of what is wasted now upon the same account; but who can picture to himself a Civil Engineer with no assistance except one young officer learning his duty, and three or four half-taught subordinates, aided by 10 or 12 talook Maistries, such as we have elsewhere described them, having the charge of all the roads and buildings, passes, bridges, tanks, channels and rivers, of from 10 to 20 thousand square miles of country, without admitting that the point for discussion is not whether the establishment is too great or not, but how it can be most rapidly and effectively increased. To those who have been accustomed merely to compare one district or talook with another, without looking to the experience of other countries, as is too much the habit of all who have spent much of their lives in India, this may not be clearly seen, say what we will in proof of our assertion; but to those who have watched the engineering, and the executive arrangements of England, this general statement of the case will convey a far more vivid impression of our wants than any individual instances, however strong.

The necessary proportion of superintendence will be less hereafter.

506. In closing our remarks on the several descriptions of superintendence, we may observe that there are two reasons why it will not be necessary hereafter that superintendence should be increased in the same ratio to outlay that is necessary now; that is to say, supposing our suggestions on this head to be attended to. The first is that as the great extent of divisions and the scattered positions of works form one reason why a larger amount of superintendence is required now, so when works become more numerous in a given space, one officer will be able efficiently to control a greater number of works and a larger amount of expenditure than at present; secondly, the spread of skill and information by means of the school we shall propose will so influence all employed in the execution of work that less teaching and managing will be required.

The control of the distribution of water.

507. Hitherto we have spoken of superintendence as it is now understood in the statement of Maramut charges, but there is another description of it that might, to great advantage, be found there; we allude to the management of works of irrigation, for the regulation of their discharge. At present, the distribution of water, collected at great expense, and with more or less care, is left in the hands of men who, though nominally Government servants, are members of the village communities, for the most part paid by the cultivators, and so ill paid that they cannot be considered proof against the smallest bribes; the richer Ryots have the command of them, and all the water that they want they take. Where a number of villages are dependent on the same supply, the bitterest animosities exist between them, as might be expected; and those who have the advantage in position have the means of injuring their neighbours, and a three-fold object in taking more water than they have an honest claim to. They can improve their crop, and injure their enemies, and, as the price of grain depends upon the quantity produced, they are the gainers at the time of sale by all the water they have wasted. The Civil Engineer of No. 7 division, when writing on a channel of Coimbatore, points out this in the following terms:

"The management of these sluices is in the hands of the Neerany Monigars and their subordinates, who receive payment from the cultivators in kind, and are of course entirely under their influence. This was a system which might have answered sufficiently well during the native Governments, when the Monigars were doubtless held responsible that all the lands throughout the channel received their share of water. They had then two fears; one, that they would lose their places, or have to pay a heavy fine if the Circar disapproved of their proceedings; the other, that they would get small measure of their dues if they failed in their duty towards the cultivators. Now the case is altered, and so should be the system. Our Government does not punish men upon an average; and as we cannot bring home to each offender what his share of the mischief may have been, we punish no one; while the cultivator has the same power of punishment that he ever had. There is but one fear now, and that is not of the Circar, but of the Ryots, who do whatever suits them with the water; and, unluckily, it suits them best to monopolize

monopolize the whole stream if they can, as there is but a small portion of the district under paddy cultivation, and reducing the quantity produced, affects the price favourably for those who have it. The wealthy Ryots occupy the higher villages, and they having the command in every way, the lands below are always ill-supplied."

The present system a bad one.

508. This system obtains throughout the country, causing a loss which we cannot estimate; but we may safely say that the water is not made the most use of, in any case where several villages are irrigated from the same tank or channel. It is usual to say how well these things are managed by the villagers themselves, but this is only because we know nothing of the distribution; the answer to all inquiry being that "mamool" (custom) has established the arrangement, and "mamool" settles all such questions in favour of the rich. The system is called good, because it gives no trouble; but the loss that we are speaking of does not affect the villagers only; when water is wasted, it is so much robbed from Government; but as the loss from this cause, being permanent, never appears in the accounts, the matter has not yet been viewed in its proper light. Indeed in Indian finance in general, while there are stringent orders against the expenditure of hundreds, no account whatever is kept of millions never realized though well within our reach. We economize a writer's penknife, and take no steps to guard against a famine. There are numberless tanks, and channels too, the waters of which, if carefully husbanded, would flow over tracts of land not irrigated now, adding to the revenue very greatly more than need be spent upon a better management.

All important works should be under special management.

509. We believe that it would answer best to have a European in charge of every work of the first class; two or three per cent. upon their present revenue would probably be well spent in placing all considerable works of irrigation under individual management, though a less sum would effect the object in many instances. By these officers such a distribution of the water would be made as would be most advantageous to the Government as well as to all ranks of the cultivators; the works would be protected by them from those injuries from wanton carelessness which now lead to so great an outlay every year in what are called the ordinary repairs; and as the season for irrigation approaches, every preparation would be made to secure a good supply of water, and prevent, as far as possible, those fluctuations in the quantity which cause such losses of labour and of seed in all the lands that are in unfavourable positions. It frequently happens in the tank irrigation, that the feeding channels are breached or partially stopped during the few hours that the parent stream is flowing, and in many cases the loss of a single flood is ruin to the crop; such accidents would be guarded against, and where accidents occurred prompt measures would be taken to correct them by the help of the village people, who having no leader to direct them now, are rarely prompt enough to act before the time is past. One of the Commissioners has seen a whole day lost, before any effort was made to repair a breach in one of the Amravutty Channels, though even in seasons when no accident occurs, there is rarely sufficient water to mature the crop. The management of all repairs within a certain limit, would also be entrusted to these officers, whose experience of the work, knowledge of the position in which the best materials might be found, and interest in the efficiency of their charge, would make them in all respects the best aids of the executive.

The increase of superintendence proposed, is not larger than necessary.

510. We have been under the necessity of writing at some length on "Superintendence," because the subject has not hitherto been carefully considered, and is evidently not understood. The calculation of the sum which might with good economy be spent upon it, has been made on wrong grounds, and the consequence has been an inclination to reduce an expenditure which was already far too small. There has been a determined stand made against every suggested increase; and where the want of engineers or any subordinates of the Engineer Department has come so prominently forward that it could not be denied or refused, the addition has been made on a scale too low for thorough efficiency, under an impression that the money spent was to yield no direct return. We have written what we hope will be sufficient to show the fallacy of the ground of calculation, and the waste that is resulting from it; and if we advise such an expenditure on superintendence (using the term in its most extended sense) as has not been contemplated before, we are sure that we propose no larger an establishment than would be profitably employed

employed upon the management or improvement of the public works, either in the reduction of waste or increase of revenue.

The want of officers.

511. We now proceed to consider the number of officers required in the various grades. We have shown in another part of our report that the prosperity of the Presidency of Madras is in a great degree dependent on its works of irrigation, and that those works are more or less dilapidated throughout the country; we will now examine how far this evil depends upon the insufficient number of Engineers. There can be no doubt that if money is withheld, any number of Engineers can do nothing to restore the Nunjah cultivation to what at one time or other it evidently has been; but, on the other hand, the means, however liberally supplied, could not effect the end desired, unless judiciously and skilfully expended. It may be objected that the ancient works were constructed without the aid of science, and such was the case; but the result was that, though the object in view was in many cases effected, it was so at an excessive cost. Vast numbers of the great works of former times which pay us well the cost of keeping in repair, would never repay the capital laid out by their projectors; they were built by forced labour, and, for their strength, depend entirely on the quantity of material used. Such is the great Darojie tank in Bellary, to repair a single accidental breach in which, and secure it from future injury, was last year estimated to cost five times its annual revenue. The object in view in the original construction of this work might have been effected at a moderate expense, and such as would have yielded a profitable return; but its actual cost must have been out of all proportion to its value.

No science in the construction of the old native works;

And hence many of them were built at ruinous cost.

512. Were it not for the science employed on them lately, many of the works that we now see in operation would have been out of use like numbers of others which have not had that advantage, in proof of which we may instance many of the most valuable channels in Tanjore, Trichinopoly and South Arcot. Numbers of the most costly works were too expensive even for the rulers of the country to complete, with all their people's labour, and never were perfected in consequence. Such was the great work begun by a native Prince at Nerinjapett, where, on a rocky bed, an anicut was thrown across the Cauvery, at a cost incalculably greater than that of those anicuts which science has enabled us to raise on the same river in places where the bed is of the loosest sand, without a rock in any part of it to aid the Engineer. The dam at Nerinjapett, after being raised to its intended height, was partially destroyed, and was abandoned as a hopeless undertaking; and from that day to this the portion that remains has not been used, although the anicut as it stands at present might even now be applied to water a whole talook in the Salem district, if a scientific officer could give his time to laying out the channels. Numberless ancient native works have been ruined, and must remain in ruins, because they were misplaced or faulty in construction, and many more have had their value increased by modern engineering. In our own time we have seen the waste of money by the native management reduced to a comparative trifle by the improvement of the Civil Engineer Department; and we need no further proof that it would be bad economy to work with any but the best trained Engineers procurable.

The want of officers has long been admitted.

513. The Civil Engineer Department is looked to as the means of improving and extending irrigation, and it has already effected not a little, considering the small means placed at its disposal; but everywhere we find statements made of the insufficient strength of the establishment. And as this has been admitted by all concerned, by the Civil Engineers, by the Board of Revenue, by the Government under Lord Tweeddale, and by the Honorable Court itself, it would seem hardly necessary for us to write upon the subject now; but when we see that what has been universally allowed as an essential want of greater or less extent, for the last 15 years, has only been nominally supplied by an addition of six subalterns to the Engineer Corps, we must take up the subject once again, and treat it as if it had never been understood. In a former part of this Report, we have already touched lightly upon the general duties of the Maramut Department: we will not repeat what we have said, but in as few words as possible give such an account of the operations in a Civil Engineer's camp as will show what the country has to depend upon for the management and improvement of its public works.

The duties required of a Civil Engineer.

514. The Civil Engineers have had no instructions to bring forward projects of improvement,

improvement, since orders to the contrary were issued; but Collectors of districts are anxious to make the best of the countries under their management, and the Civil Engineers working in concert with them, and having the same wish to benefit their divisions, rarely hesitate to offer their suggestions for adding to the prosperity of the country by public works. They do consider themselves as having that responsibility; and many have made it, as others would if they had more time to devote to it, one great object of their labours. Their first duty, as their orders now stand, is to supervise all expenditure in the repair of public works, to inspect them personally, and check, by actual measurement, as many as they can; to examine any that are said to need repair, and to estimate for what may be required, there being certain descriptions of work which cannot be executed unless personally reported upon either by an Engineer or a Surveyor of the Department, such being the condition on which the Government sanction for the work is given. And of late years this condition has frequently been annexed in the case of estimates of very small amount, such as for the building of a Bungalow or a Police Cutcherry, which were not to be commenced till the excavation for the foundation had been seen by one of the department. It is no less the duty of the Civil Engineer to inspect or ascertain, in any way he can, the condition of the works of irrigation, so that he may avert as well as remedy the damage they are liable to. The latter duty is indeed of paramount importance, as on it, in a great degree, depends the cost of keeping the works in repair. The general control over all the works of irrigation has to be carried on in immediate communication with the Collectors of Districts and the Board of Revenue. No work, however small, can be done without a detailed estimate, made either by the Revenue Establishment or by that of the Civil Engineer, and all estimates, by whomsoever prepared, have to be examined and attested by the Civil Engineer himself. With the works of communication the case is similar, except that there being no direct revenue dependent upon them, they have not, in the same degree, been considered the special objects of the Civil Engineer's attention. All estimates, and bills for work connected with them, however, in like manner, have to pass through his office for examination and check. All plans for bridges have to be made by the Engineers, as have also all considerable estimates for roads and ghauts, the latter, in some parts of the country, being a most important item in the labour of the year. All civil, ecclesiastical and military buildings, as well as those under charge of the Marine Department, are in like manner under the Civil Engineer's supervision. A diary in detail of all the proceedings of each day has to be sent in once a month by the officers of the department, besides a number of periodical statements.

Extent of his office work.

515. The actual amount of office work that all this entails cannot be clearly shown, but it may be inferred to be large, from the fact that, in the year 1850, above 5,000 estimates were forwarded to the Board, together with the plans for all the new works. Bills to about the same number were sent in; and in all cases of the bill exceeding the estimate by five per cent., explanations were required and given. The amount of correspondence, extending to the most minute matters, fills the records of the department, and adds very greatly to its labour. This is all that can be said, in a small compass, to give an idea of the office work in the Civil Engineer's Department, an amount of labour which would be considered heavy, if the establishment were stationary, instead of being almost constantly in motion, as is the case with the Civil Engineers' camps in general. With this amount of office work, and a camp moving at the utmost 10 miles a day throughout the year, it may be imagined how little 25 officers of Engineers, with their 25 Surveyors, can do to watch, repair or improve the 70,000 tanks and channels existing in the Ryotwar districts of the Madras Presidency, even if they had not the roads, ghauts and buildings to attend to; and we must explain what amount of engineering these 70,000 "works," so called, require.

All tanks constantly require more or less of his attention.

516. A great portion are small tanks, the treatment of which is simple enough; but which, if left to themselves, are constantly injured, and their repair has ever caused the chief ordinary expenditure of the year. Mismanaged, neglected, or left for a time unseen by any but the talook servants, they gradually deteriorate, till a sudden fall of rain destroys them, and they have to be rebuilt. Many thousand are tanks of a larger description, having an area of from two to four square miles of surface, which have not only to be guarded against the effects of waves and rain, but require careful attention to secure their having a good supply of water.

Danger from works being insecure.

This class of works, as may be supposed, requires the attention of officers of experience, and should be constantly under the eye of the Civil Engineer. Other tanks are still larger, perfect lakes indeed in extent, covering from 4 to 12 square miles. These have large channels for supply, and works of masonry of great size; and on their safety depend lives and property to a vast amount. In the year 1836, when the North Arcot and Chingleput districts were visited by a most violent storm, the town of Madras had the narrowest escape of a frightful visitation from the Cauverypauk tank not being in a secure state. When the gale ceased, it was found that the waves had been thrown over the bund where the water was deepest, and the embankment had been so nearly cut through, that, but for a sudden change in the wind, it would have been destroyed. The breadth of soil left at the top was only half a yard. A few minutes would have washed that away, when the whole contents of the enormous tank, not less than 12 miles in circumference, and in parts 25 feet in depth, would have flowed through 70 miles of country, carrying with it the large tank of Chembrumbaukum, and numberless smaller ones; and their whole accumulated waters would have fallen into the Cooum and Adayar, at that time far above their banks, and already causing great damage in Madras. To report upon the condition of the Cauverypauk bund, it was necessary to send up an officer not belonging to the division, and engaged on other duty at Madras, the Civil Engineer being too far distant. Had the accident occurred, the ruins of a great portion of Madras would have shown to the Government how bad is the policy of leaving the charge of such works to the management of a department admitted by all to be altogether insufficient in numbers.

Extensive losses from that cause occur almost every year.

517. Nor is it always such large and conspicuous works as this which lead to ruinous losses. As tanks are always formed in valleys, they are often in continuous lines, following the natural course of streams, so that the surplus water of one flows into and indeed is the main source of supply to those below it. The danger resulting from this will be clear to every one: the calingulah or outlet for the surplus being a more or less expensive kind of work, is usually made sufficient to discharge the drainage of the valley, and no more, as when all the tanks are in repair nothing further is required of it; but in case of an accident happening to one of the upper works, its water is poured suddenly into that below, the bund of which is destroyed by the flood, and the accumulating waters sweep away all before them, tanks, crops, and not unfrequently villages, with their cattle, and even people. Such was the case in Cuddapah, some years ago, when 16 fine works were swept away in a single valley; the first work that failed being one so small, that nothing but the accident it caused would have then led the officers, who had a thousand others to attend to, to visit and examine it. This year such a flood has happened in several places: indeed it would hardly be too much to say that not a season passes without one or more cases of the kind; and the origin of the accident is often the want of care in some one village, where the bund has not been looked to, and perhaps a cattle track across it has worn away the earth, and let the water over. In many instances, a single cubic yard of earth would have averted the ruin. A small sum spent judiciously would have saved lacs of money lost to the Government in revenue and repairs, and the people of the valley from the loss of all their crops. That much of this results from apathy in the inhabitants and talook servants there is no doubt; but having, as matters stand, no better guardians of the public works, a constant watchfulness is quite as necessary in the Engineer Department to save the tanks entrusted to its care, as skill in managing their repair when damaged.

The channels.

518. Another class of works consists of channels, of which there are very many thousand in the country. Each channel in this list is called "a work," though it is in some cases a system of several hundred separate works, dams, regulating sluices, calingulahs, and sluices for the distribution of its water. There are numbers of these channels, on which it would answer to have the Engineer entirely occupied with a single channel only, rather than that it should be left to the thousandth part of his attention, as is the case at present. We may instance one of the channels of Coimbatore, the Calingaroyen. This channel is 52 miles in length, and depends for its supply upon a rough stone dam between 20 and 30 feet in height. It has a number of calingulahs and sluices to carry off its surplus water where the drainage of the country crosses it, and its water is distributed by 2,000 tunnels in its bank. The extent of cultivation dependent upon it is 8,000 acres; and the value of the crops of one year to the Government and the people is

Instance of the Calingaroyen Channel.

is little less than two and a half lacs of rupees. There is no part of this channel that does not require some skilful treatment. The anicut, during a part of the year, does not supply it as it might; at other seasons when water is scarce at the lower end of the channel, it is necessary, in consequence of the insecure state of the bank, to allow a great portion of the stream which enters it to be discharged by the surplus sluices; and there is not one of all the 2,000 outlets for the distribution of the water, which does not cause a waste in its expenditure of water very greatly above what is necessary. The irrigation from this fine work ends in an open and well-peopled country, the further portion of which, now without irrigation, only wants water, to be as fertile as the lands which it already reaches; much of the latter land yields to Government a revenue *Rs.* 30 an acre, being more than 10 times what is paid by the former or unirrigated lands. There cannot be a doubt that on such a work as this there is full occupation for an Engineer of the best experience. This, it is true, is one above the average in importance, but it is by no means one in the worst condition. We select it as an instance, because we have the facts regarding it at hand. There are numberless other works, both tanks and channels, each of which would in like manner repay the Government the cost of an Engineer, with no other occupation than to make the most of it.

Other instances.

519. In his report printed in our Appendix (B.), paras. 15 and 16, Colonel Cotton mentions two cases of serious loss from the want of Engineer officers. The aggregate direct loss to Government in revenue in the two cases, before the mischief was corrected, was more than 27 lacs of rupees, though it cost only one lac and three quarters to make the necessary repairs and restore the revenue, as soon as Engineer officers could be spared for the work. Nor was the large sacrifice of revenue by any means the whole evil of this neglect: to the owners and cultivators of the soil it brought impoverishment and ruin, as is vividly described in para. 19 of the same paper.

The Tadapully Channel.

The Tadapully Channel in Coimbatore may also be quoted. In speaking of that channel, in his diary for September 1850, the Civil Engineer of the 7th Division thus expresses himself: "To give some idea of the loss that may result from a bad system of management in such a channel, I find from the accounts brought forward by Kistniah, that from the year 1811 to 1848 there was a loss of about *Rs.* 9,00,000, taking the revenue of the year 1809 as the standard of what might have been collected from first to last; which the collections of late years have proved to be no greater than might have been received annually." Had a Civil Engineer been in charge of this channel alone for the whole of the last 40 years, with *Rs.* 1,000 a month, the Government would have saved four lacs out of the nine, and the cultivators would have been at least 12 lacs the richer for it. But had this been the case not only would the actual loss now spoken of have been saved, but the water might have been turned to so much better account, that it would have been carried on to new lands, capable of producing half as much again both to the people and to the Government as it produced last year, and estimates for effecting this are now under preparation. In giving this instance, and pointing out how well even *Rs.* 1,000 monthly might have been spent upon the management of this channel, we must not be understood to say that so large an outlay was required; we only wish to show that even such extravagant expenditure would have been far better policy than the so called good economy of the present system of no management.

The Ponnairy tank.

520. Another instance may be quoted in the Ponnairy tank. This tank in the Trichinopoly district, now in ruins for many years, is on a gigantic scale. The bund is 26 miles in length and of great height, furnished with two sluices of substantial masonry, and still in good preservation; it was supplied with water from the Coleroon river by a channel 62 miles in length, as well as by a smaller channel from the Vellour. The whole of the country once fertilized by this stupendous work is now waste, and in great part covered with thick jungle, except a few poor villages scattered here and there, with a limited extent of cultivation attached to each. Since 1832 the restoration of this tank has been repeatedly urged on the Board of Revenue by the local officers; and in 1837 the bund and channel were examined sufficiently to ascertain generally the feasibility of the work. The Board then directed the Civil Engineer to make a thorough survey and estimate as soon as he could find leisure; the present Civil Engineer, too, has been very anxious to do this, but hitherto, owing to the constant and pressing calls on his attention, he has been unable to give the necessary time. The Collector of Trichinopoly, in

writing about this work to the Board of Revenue in 1837, stated that the Ryots of the Oodiarpolliem talook had engaged to bring 9,000 cawnies (12,000 acres) of land into rice cultivation if the tank should be restored; that even this extent would yield between *Rs.* 80,000 and *Rs.* 90,000 to Government annually, and that it did not nearly approximate to the whole extent of land that would be ultimately reclaimed.

The Chembrumbaukum tank.

To these cases may be added that of the Chembrumbaukum tank in Chingleput district, which has land under it bearing an assessment of *Rs.* 62,000, besides *Rs.* 10,000 of Enam land. During the five Fuslies, 1255 to 1259, the lowest revenue from the tank was *Rs.* 21,700, and the highest *Rs.* 47,000; and this large fluctuation occurred within three years, the former being in Fusly 1256, and the latter in Fusly 1258. The sole cause was want of water; for the channel from the Cortiliar river which formerly supplied the tank, had become choked up to the depth of 5½ feet, and the tank was left almost wholly dependent on the local rains. In December 1850 the Civil Engineer visited the tank, and made an estimate for clearing out the accumulation; the work was done in the early months of the following year, at the cost of less than *Rs.* 4,000, and in three days of rain in May above 5,300,000 cubic yards of water entered the channel; the value of that quantity for revenue to Government being above *Rs.* 5,000, so that the cost of the repair was much more than repaid in those three days.

The northern districts even more neglected than the Carnatic.

521. Similar instances, though not all on so gigantic a scale, might be brought forward in all parts of the country; but from the reports we have received from the northern districts, there must be even more necessity for the presence of Engineers there than in the most neglected parts of the Carnatic. In answer to our questions on the subject, we have a paper from the Civil Engineer of the 1st Division, which is so full of proof of what we are now stating, that we are induced to append the whole of it to our report (Appendix C.). It will be seen by that paper that not only has the East India Company's own territory been allowed to go to ruin, but even a property held in trust for a Zemindar has in like manner been most seriously injured by the neglect of its works of irrigation. It does not appear that in those districts the Government has withheld the means when asked for; but no applications have been made, because there have been no Engineers to point out what was wanted; and now that the necessity for some expenditure on every tank and channel in the country is brought to notice, there are none to plan the works required. Mr. Walter Elliot, the Commissioner of these districts, urges that more officers may be sent to him; and the native Zemindars have seen enough in the operations on the Godavery and elsewhere in the last few years, to beg that they also may in some way or other have the advantage of the services of Engineer officers, but none are to be had. The present state of the country and of the department shows the wisdom of the opinion declared by the Court of Directors, in their despatch of the 17th December 1833, in the following words: "They attach great importance to all works in the department being placed under the constant personal control of European officers, and they hold it to be an unwise economy to commit the management of expensive and important works to native agents." Since this despatch was written, 18 years' experience, and a loss we cannot calculate, have confirmed the soundness of the view then taken; and we would add our most urgent recommendation to that so often made by the Board of Revenue (and on one occasion, at least, by the Marquis of Tweeddale), that the paragraph above quoted should no longer remain a dead letter on the records of Government.

The roads;

522. What actual loss is occasioned by the want of communications throughout the country it is impossible to say; but in the present day, when the value of cheap and rapid transit is so well understood, we need hardly do more than point out, as we have done in another part of our report, the present cost of moving goods and passengers, to show the want of engineering for improved means of locomotion in every part of the country.

And the Government buildings.

In the Military Building Department there is also a deficiency of Engineers, but the number required will depend upon the new organization of the Civil Branch. As we propose so to arrange the duties of that establishment, that all buildings at present under the Military Board within the provinces shall be under the management of the Engineer of the division in which they are situated; and only under Engineer officers, specially appointed, when beyond the frontier.

523. Our

Great want of statistical information as to the works in the country.

523. Our inquiry into the past leads us to the conclusion that, from the want of officers and means, hardly anything has yet been done to bring to light the capabilities of this Presidency; but it affords no data on which to judge what a sufficiency of engineering care and attention might effect. Not only has no account been taken of the works of irrigation in an unserviceable condition, and of which there are many thousands in the country, but till this time it has been found impossible, with the present establishment, to collect and record even the names and value of those in use; and when we attempt to define what additional strength is required for the Maramut Department, we find ourselves altogether at a loss in this the first point of our inquiry. Nothing more can be said at this moment as to the general condition of the works, either of irrigation or communication, than that some slight effort has been made in the last few years to get a portion of them into better order, and, it is supposed, with as much success as might have been expected from the sums laid out.

And if we find ourselves at fault as to the condition of the works now used, it may be well imagined how little we can judge of the means required for turning to account the main resources of the country as yet untouched. In the orders of the Board of Revenue or Government, there are no calls now for projects of improvement. There have been times when projects volunteered have been accepted by the Government, and (as will be seen elsewhere) well has the money been repaid that was at those times granted; but, as a general rule, we find the projectors standing before the Government as petitioners, on some occasions to have their offers so refused as to induce them to suppose that such suggestions were obtrusive. It was not likely, therefore, that we should have before us any papers showing, in detail, the capabilities or the wants of Southern India; all we know is, that the communications of the country are in a ruinously inefficient state, that the irrigation of no one district is complete, that the present establishment is not nearly strong enough to keep the present works in order, and that the higher floods of all the rivers filled by the never-failing rains of the south-west monsoon, now flow entirely to waste. These facts are evident; and we have before us sufficient proof that in the extension of the works of communication, as well as those of irrigation, the Government has received as great a benefit as has been conferred upon the people.

All an Engineer's projects are necessarily prepared in a hurry.

524. It may be gathered from the foregoing remarks, that the camps of the Civil Engineers are constantly in motion; and even moving with the greatest speed attainable, every officer in the department feels that he is always wanted where he cannot go, in spite of all his efforts: the more he sees and does, the more anxiety and cause for haste he brings upon himself; and while in this state of restlessness, if he is to advance the country that he travels over, he must find time for projects of improvement, and snatch it as he can from days already crowded with other urgent duties. His information must be taken hurriedly, his observations of the ground must occupy as few days or hours as possible, and, in drawing up his estimate, he must do it with his camp still moving on, out of reach of books of reference, and working with people weary of the constant travelling, and with good reason discontented. Added to this, as has been before mentioned, he has the roads, ghauts and all public buildings more or less under his control; move where he will, he finds more work wanted than he and his subordinates can effect, and he has no season of recess or rest.

The proposed establishment.

525. Having premised these few remarks, we now proceed to consider the establishments which, after a careful consideration of the subject, seem to us necessary for the efficient working of the Public Works Department. In Appendices (D D.) to (F F.) will be found the details of the whole establishment proposed, in all the various grades, with their salaries and distribution. The whole naturally divides itself into four parts; viz. 1st, the Commissioned Officers; 2d, the European Subordinates, warrant and non-commissioned; 3d, the Native Subordinate Department; and, 4th, the Office Establishments. We will here offer a few remarks on each of these divisions, with the view of explaining the grades, numbers and salaries which we propose in each; and we begin with the Commissioned Officers. The following Table shows the particulars of our propositions as respects this branch of the service:—

RANK.	Class.	Number in each Class.	Number in each Grade.	Monthly for One of each. Staff Pay.	Tentage.	Total.	Total Annually. For One of each Class.	For each Class.
				Rs. a. p.	*Rs. a. p.*	*Rs. a. p.*	*Rs. a. p.*	*Rs. a. p.*
Chief Engineer			1	—	—	—	—	—
Adjutant of Engineers			1	—	—	—	—	—
Members of the Board			2	1,100 – –	– – –	1,100 – –	13,200 – –	26,400 – –
Secretary to the Board			1	500 – –	– – –	500 – –	6,000 – –	6,000 – –
Inspecting Engineers	1st	1	– –	1,000 – –	– – –	1,000 – –	12,000 – –	12,000 – –
	2d	12	13	700 – –	121 10 8	821 8 –	9,860 – –	1,18,320 – –
District Engineers	1st	8	– –	500 – –	91 4 –	591 4 –	7,095 – –	56,760 – –
	2d	8	– –	400 – –	91 4 –	491 4 –	5,895 – –	47,160 – –
	3d	8	24	300 – –	91 4 –	391 4 –	4,695 – –	37,560 – –
Assistant District Engineers		– –	– –	100 – –	60 13 4	160 13 4	1,930 – –	38,600 – –
Special Assist. ditto ditto 9	1st	1	– –	600 – –	– – –	600 – –	7,200 – –	7,200 – –
Permanent Exect. Officers, 12	2d	8	– –	400 – –	91 4 –	491 4 –	5,895 – –	47,160 – –
Occasional ditto - ditto 30	3d	18	– –	250 – –	91 4 –	341 4 –	4,095 – –	73,710 – –
Total – – 51	4th	24	51	150 – –	60 13 4	210 13 4	2,530 – –	60,720 – –
Total Commissioned – –	– –	– –	113	6,000 – –	699 9 4	6,699 9 4	80,395 – –	5,31,590 – –

What duties require Engineer officers.

526. It appears to us to be essential to an efficient system, that officers invested with the duty of projecting works, and controlling the operations of the department over an extensive tract, should be men with minds enlarged by a liberal, and invigorated and trained by a scientific education; and it further appears to be necessary that, even in positions of secondary importance, but which nevertheless require the constant exercise of engineering science and skill, Engineers alone should be placed.

An Engineer officer and assistant to each district.

Our scheme for the employment of officers of Engineers is based on this foundation: we propose, first, an officer to every district as the head of the Public Works Department within it, including works of Irrigation, Roads and Buildings. His duties will be similar to what we have already described those of the Civil Engineers to be now; except that, having a less extensive charge, and being relieved of one part of the duties of that by the Inspecting Engineer, he will be able to exercise a much more effective control over the department in all its parts, than it is possible for the Civil Engineer to exercise at present. We have already described the evils inseparable from the present deficiency in the numbers of the department; and without here going over the subject again, we will merely remark that a sufficient and well-organized professional establishment is all that is required to remove them. We propose, also, that each of these 20 District Engineers shall have an Assistant; the object of this arrangement being partly to give assistance to the District Engineer, but principally to train up a body of young officers in the practical knowledge of Indian Civil Engineering, especially as respects the uses, incidents and management of hydraulic works, the want of which knowledge in officers appointed to the department is now a source of heavy loss to Government. The Assistant being usually with the District Engineer, and seeing his projects and his mode of dealing with works, will gain that practical skill before being intrusted with important duties himself, which is now only to be acquired, as we have already observed, by a succession of mistakes. The Assistants will also be occasionally employed in the execution of important works; and by this twofold training, they will become fitted for the charge of a district.

Four District Engineers for Mysore.

527. We propose also to provide four District Engineers for the four divisions of Mysore. Those divisions are not less extensive than the Collectorates of the Honourable Company's own provinces; and though irrigation is not so general there, yet works of that nature are by no means few, and these, with the roads and other public works, are fully sufficient to require this number of Engineers. We have not provided assistants for them, because the quantity of work is smaller, and because we believe that 20 officers of that class will be sufficient to supply vacancies in the department, allowing about two or two and a half years in that grade to every officer.

The Inspecting Engineers.

528. The Inspecting Engineers provided are 13 in number; viz., one for the Presidency division, nine for the nine Maramut divisions, one for Mysore, one for the Saugor division and territories, and one for the railroads.

The duties of the Inspecting Engineer of the Presidency division have been already

already detailed; in the interior they may be described as chiefly those of control, though the Inspecting Engineer will himself take a personal share in the investigation of extensive projects. His general duties, however, will be to receive and forward to the Board, with his opinion, estimates made by the district Engineer and his subordinate; to receive, examine, and send up bills for works done, with his opinion as to the style of execution and the charges; to inspect large works executed by the District Engineer and his department, to direct the attention of the latter officer to matters most requiring it, and to guide and assist him with his advice; in short, he will stand between the District Engineer and the Board of Works, relieving the latter from much trifling detail, and both aiding and controlling the former. His duties will vary in the several divisions; for it is evident that the junior of the district Engineers must always be officers of limited experience; and in districts under the charge of such, the interference of the Inspecting Engineer will be more minute than under other circumstances. We have provided for one officer of the rank of Inspecting Engineer for the railway or railways; for it appears to be determined that these undertakings are at length to be entered upon; and whether they are constructed by the immediate agency of the officers of Government, or are entrusted to other hands; in either case, after the example of Bengal and Bombay, at least one Government Engineer Officer of rank will be appointed to control the operations.

Total of commissioned officers.

529. Thus the establishment of commissioned officers which we propose in the provinces, so far as concerns the general duties of the country, is as follows: 10 Inspecting Engineers, 24 District Engineers, and 20 Assistants. And we are decidedly of opinion, that it cannot be reduced below this without sacrificing efficiency.

Opinion of the Marquis of Tweeddale;

The late Governor, the Marquis of Tweeddale, was fully alive to the necessity of increasing the Maramut Department; and though he was uniformly jealous of any enlargement of establishments, yet, in a minute which he recorded in Council on the 25th August 1846, after full consideration of the subject, he stated his conviction that it was necessary to have an officer of Engineers attached to every Collectorate, besides the Civil Engineers of divisions.

And of the Board of Revenue.

The Board of Revenue were called on in the same year to state the wants of the department; and in their reply (15 February 1847, Appendix G.), they declared that the number of Engineer officers required for its efficiency was 28 in permanent territorial appointments, besides four for special duties. This letter from the Board, as well as the Marquis's own minute, was sent home to the Court of Directors, who ordered that the subject should be brought before the Government of India. This was done, and that Government having called for further information, the Board, in supplying it (Appendix H.), reiterated their decided opinion, that the permanent establishment ought not to be less than one Engineer officer to each of the 20 districts, in addition to the eight Civil Engineers. The orders emanating in the course of that correspondence, both from the Madras Government, the Court of Directors, and the Government of India, evinced the strongest disinclination to allow any increase of the establishments, of which feeling, indeed, the repeated postponement of a decision is a sufficient proof; and it is evident that the Board did their utmost to meet the wishes of the powers above in this respect, as far as their practical conviction of what was necessary permitted. But in spite of this anxiety in the Board, although they did not contemplate any enlarged system of operations, and evidently did not keep in view the necessity of doing something to improve the roads; and though they then had nothing to do with the trunk or main roads, notwithstanding all these circumstances, they felt themselves compelled to state the foregoing numbers as the minimum establishment of Engineer officers.

We propose no more than we are persuaded true economy requires.

530. We have given the subject our most earnest consideration, being not less anxious to observe true economy, and to recommend nothing not required by that; and though we have in view larger operations than the Board then contemplated, and though we have to provide for the trunk roads as well as the branch roads, we propose no larger a permanent establishment of commissioned officers than they did, except that we consider it necessary to divide the present enormous 1st Division into two, and that we ask for assistants to the District Engineers, chiefly with the view of providing a succession of trained officers for the district appointments; as it would obviously be most absurd and ruinous to place a young officer totally new to the duty, in immediate charge of an extensive department.

But though we have made no material addition to the number of commissioned officers required by the Board, we propose a much larger and more efficient establishment of subordinates than they contemplated, although it is shown by other papers that the Board were quite alive to the importance of strengthening that branch of the service. We shall come presently to notice our proposals in this grade, and meanwhile we will only observe, that with a sufficient establishment of superior officers such as we propose, these subordinate grades present the means of increasing the efficiency and extending the operations of the department with very small proportionate outlay. The commissioned officers, indeed, will form a frame or skeleton of control, quite necessary, even at present, for the extensive countries over which they have to operate; but which can be filled in from time to time as necessity may require, with officers of inferior ranks and qualifications, without by any means a corresponding augmentation of the duties of the controlling officers, and consequently without a proportionate increase of their number.

All the foregoing appointments should be always kept full.

531. We say, without any hesitation, that a smaller permanent establishment of officers than that which we propose, would not be efficient; that is, that it would be bad and losing policy to make it less. And one thing must be especially insisted on in connexion with this establishment, viz., that all these officers must be considered permanent; and on the occurrence of a vacancy it must be filled up as a matter of course, just as much as the office of Judge or Collector, or subordinate Judge or Sub-collector, is always kept full. This branch of the public service is not less essential to the prosperity of the revenue and the well-being of the people, than the revenue or judicial establishments; and it ought no less than they to be regarded as a permanent department always to be kept up at its full strength. This was justly put forward as a principal point by the Board of Revenue in their letter to Government last referred to (Appendix H.); and unless it is made the invariable rule and practice, there can be no security for the efficiency of the department. It may occasionally be absolutely necessary, in case of war or other emergency, to withdraw the holders of these appointments to other duty, though that should be avoided as much as possible; but whenever that happens the vacancy should be filled up, *ad interim*, according to the general rule of the service in other branches, so that its ordinary duties at least may be conducted without hindrance.

Reasons for dividing the 1st Division.

532. Our reasons for thinking it necessary to divide the present 1st Division are its enormous extent, and the great value and importance of the works it contains. As to its extent, it consists at present of five Collectorates, having an aggregate area of more than 30,000 square miles, very little less than the whole of Ireland, which measures only 32,000 square miles, and its extreme length, in a straight line, exceeds 450 miles. As to its works, it contains the deltas of the Godavery and the Kistnah rivers, in both of which very extensive operations have been ordered, and are already in progress, for turning the waters of those rivers to use for the purpose of irrigation on a large scale. The heavy pressure of duty even in connexion with the works on the Godavery only, was such as to occupy almost the whole time of the Civil Engineer, aided as he was by a number of additional officers. The Government was induced, therefore, in 1847, to constitute the two districts of Ganjam and Vizagapatam a separate charge; and recently, when the Kistnah anicut and its connected channels and other works were about to be undertaken, a further division was most properly made, by nominating an Engineer officer with the rank and allowances of a Civil Engineer, to the separate charge of those operations, and of the districts of Guntoor, and nearly the whole of Masulipatam; thus leaving to the Civil Engineer of the 1st Division, only the Rajahmundry district and the small part of Masulipatam which is to be watered from the Godavery.

How to be divided.

533. And if efficiency is to be attained, this partition must be permanent and not merely temporary. The Board of Revenue have deliberately declared their opinion that the delta of Tanjore requires the full professional complement of a division, and undoubtedly it does so. And yet the greater part of the works there are completed and actually in operation, while on the Godavery, and still more on the Kistnah, almost everything yet remains to be done. We propose then to subdivide the present 1st Division by separating from it the Guntoor district, and the whole of that of Masulipatum, except the small part of it which is included in the delta of the Godavery; and the 1st Division will then consist of the districts of Ganjam, Vizagapatam and Rajahmundry, with a small part of Masulipatam.

patam. We propose that the newly formed division shall be called the 2nd Division, the present 2nd to be called the 3rd, and so on; we have already mentioned, para. 204, that we propose to place the Executive Officer of Hyderabad under the Inspecting Engineer of the 2d Division.

The wants of Ganjam and Vizagapatam.

534. Ganjam and Vizagapatam will each have a District Engineer and an assistant; they will be an integral part of the 1st Division, and will receive their due share of the attention of the Inspecting Engineer. Those two districts, like the rest of the Northern Division, have been hitherto far too much neglected; but there is very much work to be done in them of an engineering character. They comprise an area of 14,000 square miles, being double the size of Wales; they contain nine military cantonments, and a multiplicity of civil buildings. It is true that a large part of each district is under Zemindary tenure, and the irrigation works in those portions are not the property of Government; but it is equally true that many of the Zemindars would be glad of professional aid in the improvement of their estates, and the Honourable Court have expressly directed that such aid shall be given them; and also the irrigation works of the Government portions of these districts have been more neglected than in any other part of the Presidency, and require a large share of attention. Again, the roads in that division, both the main lines and the country or district roads, have shared in the general neglect, and are as bad as in any part of the Presidency; and lastly, they contain several seaports which require to be attended to and improved.

The Mysore and Saugor Divisions.

535. In providing four District Engineers to manage the works in the Mysore country, we have been influenced partly by what we have learnt from Major Green, the Superintending Engineer, as to his want of assistance; but chiefly by a consideration of the extent of the territory, and of the quantity of work to be done, and of that actually done, though without the advantage of adequate professional assistance. The Madras establishment has hitherto furnished the Engineer officers for that territory, as well as those for the administration of its affairs in every department; although the country, as well as all officers employed in it, is removed from all control or interference by the Government of the Presidency of which it naturally forms a part. The District Engineers will in like manner, it is presumed, be under the Indian Government, while the present arrangement continues, and not under the Government or the Board of Works of their own Presidency; but it is supposed that the Executive Engineer of Bangalore, and in all matters connected with military buildings, the Inspecting Engineer also, will be under the Board of Works. In the Saugor Division also there is a divided authority, but the partition is different from that in Mysore; we have already described its complicated character. The Superintending Engineer and the Executive Officers are under the Military Board of Madras in all parts of their duty; but the Military Board acts under the orders of the Madras Government as respects this division in military matters only; on all road works in those territories they correspond with the Government of Agra; while as respects the buildings in the Political Department, they communicate with the Government of India. Beyond giving a fourth Executive Officer, we have not provided for any increase of strength in the Engineer Department in that division, though the present establishment is obviously unequal to the general duties of a division of above 29,000 square miles, besides detached stations and roads; because we are uncertain how far that territory, which is not a part of this Presidency though occupied by Madras troops, falls within the scope of our duties.

Executive Officers at military stations.

536. To conclude our notice of the fixed and permanent establishment, it only remains to advert to the Executive Engineers to be appointed at the large stations. These will be 12 in number; there must be one for the Presidency Division, charged with all executive duties connected with the valuable and numerous public buildings, bridges, &c., at the Presidency itself, as well as at the neighbouring stations of St. Thomas' Mount, Poonamallee and Palaveram. The large military stations beyond the frontier will also require Executive Officers; they will be Hyderabad, including Bolarum and Jaulnah, at which latter place there will be a Warrant Officer of the Department, Kamptee, Bangalore, Cannanore, the Neilgherries, the Tenasserim Coast and Sincapore; besides four Executive Officers for the several circles of the very extensive Saugor Division already noticed. Out of this number, there are already Superintending Engineers at Hyderabad and Kamptee, whose appointment is to be abolished, and the duties to be transferred

to the Executive Engineer. In the Straits Settlements there has always been a Superintending Engineer, till dispensed with lately, because an officer of lower allowances was desired, a want which will be met by our proposed arrangement. At Tennasserim there is an Executive Officer belonging to the Bengal army, though the whole of the force in the province is from Madras. At Bangalore it appears very necessary to have an Executive Officer for the duties of so large a station, so as to avoid taking up the time of the Inspecting Engineer of the division, or the District Engineer in whose limits the cantonment stands, with the detail of works in the station. At Cannanore the want of such an officer has long been felt, and in the absence of one, the whole time of the First Assistant to the Civil Engineer for many months was devoted to works at that station, being wholly withdrawn from the duties of the division at large. As to the Neilgherries, the new barracks now in building there will require more than one officer for the next four years, and an Executive Officer will certainly be required there permanently.

Officers for special projects.

537. But besides the officers filling permanent appointments, others will be required for special duties; that is, for investigating special projects, either of irrigation, of communication, or of other kinds, and for executive duties in connexion with them. As respects the former, the Board of Revenue in their letter to Government of the 30th July 1849 above referred to (Appendix H.), pointed out the necessity of having a number of officers in the department specially engaged in the investigation of great projects of works, and stated four as the number of officers sufficient for this purpose. We fully concur as to the necessity of officers for this object, and we will mention a few undertakings with which our very limited knowledge has made us acquainted, though in doing so we would not be understood as attempting to give a list of all the large undertakings for which openings exist; that is by no means our intention, as we are very far from having the necessary information:—

1st. The completion of the channels and other works in connexion with the Godavery anicut.

2d. The very extensive channels and works required in connexion with the Kistnah anicut. The laying out of all the channels, and the planning of the sluices, calingulahs and other works connected with these two great undertakings, altogether independently of the Executive, will call for a large amount of engineering skill. The want of both engineering skill and executive means has delayed and continues to delay the completion of the Godavery works, and so to postpone the increase of revenue certain to be derived from them; and the same causes are likely, under present circumstances, similarly to delay the Kistnah works, though the project long ago received the sanction of the Court of Directors, and has been commenced.

3d. The restoration of the anicut across the Cauvery at Nerinjiput in Salem district.

4th. The restoration of the Ponnairy Tank and Channel in Trichinopoly District.

5th. The improvement and extension of irrigation from the Toombuddra River in Bellary District.

6th. Arrangements for turning to use the flood waters of all the large rivers of the Peninsula, including the Cauvery, which now flow almost entirely to waste. This, though here set down as one scheme, comprehends a large number of separate undertakings, each requiring careful examination of extensive tracts of country, but promising a vast and certain increase of wealth and revenue.

7th. The improvement of the principal rivers of the Peninsula, so as to render them navigable; more especially the Godavery, with its several branches, and the Kistnah. We have already adverted, at some length, to the vast benefits to be secured by opening the former river, and the smallness of the outlay by which that object may probably be effected.

8th. The laying out of canals along both the coasts of the Peninsula.

9th. The tracing of passes to form roads for connecting the interior country above the ghauts on both sides of the Peninsula, with the plain country at their foot, and with the coast.

10th. The laying out of main lines of road, where, as will often happen, the ordinary duties of the district prevent the District Engineers from giving sufficient

sufficient time to them. To make a road effectively and economically, a careful and skilful examination and survey of the ground must be made before the work is begun; and provision for this operation must be made.

11th. The sewerage of Madras and its suburbs; and in conjunction with that, the provision of a sufficient supply of good water for domestic use. Both these two subjects, so important to the health, and in a measure to the lives, of a population of 700,000 persons, have recently been indefinitely postponed by Government, after some inquiry, on the mere ground of expense. But in the present state of knowledge and of public feeling on such questions, it seems impossible that this postponement can be of very long duration.

12th. The improvement of the roadstead of Madras, by the construction of a breakwater outside the anchorage, and diminishing the existing inconvenience, expense and risk of the communication between the shore and the shipping, by means of a pier or jetty. There is reason to believe that both these enormous benefits to the commerce of this port and of the country, might be gained at a cost very small in comparison.

The Board of Revenue specified four as the number of officers constantly required for the examination of irrigation projects only. Taking a wider view of the requirements of the country, and even making allowance for more spare time from a larger permanent establishment, we still think that nine officers will be a very small number for these duties. We propose to style them "Special Assistant District Engineers." Although their number is the same as that of the divisions, we do not at all intend that they shall be so distributed; our design is that they shall be employed wherever wanted, but generally under the immediate control of the Inspecting Engineer of the division in which they are working.

Occasional Executive Officers.

538. As to the employment for Executive Officers, their services will be required very extensively whenever the improvement of the irrigation works and communications is extensively entered upon. They will be largely required on all such works as those which we have just enumerated; and indeed wherever large projects of improvement are in course of execution. Nor then only, for it will be found necessary to appoint officers of this class permanently to the charge of portions of road, as well as to canals, after completion. Even at present, with so little work undertaken, and the unvarying cry from all quarters that there is not sufficient means of doing even that little efficiently, no fewer than 20 such officers are employed in the execution of works; and it may safely be assumed therefore that hereafter, not fewer than 30 such officers will be required. Thus the whole number of officers required for special and for executive duties connected with irrigation and the means of communication will be 39.

All of them need not be Engineers.

539. We must here observe, however, that we are not of opinion that all these officers need be Engineers. In all positions where engineering skill and science are required, we would employ professional officers only; but where the duty is merely to carry into effect the plans of others, requiring not a knowledge of engineering, but only or chiefly activity, ingenuity, resource, and the talent to call out the energies of men, and to direct the exertions of a body of labourers to advantage, there the requisite qualifications may successfully be looked for among the ranks of the unscientific corps of the army. In accordance with these views, we would confine all the permanent appointments in the Maramut Department, all the Inspecting Engineerships, and, as a general rule, all the special appointments for the examination of projects, to the professional corps; and it would generally be advisable that the Executive Engineer at the Presidency, as well as those at stations such as Tennasserim, Sincapore, Hyderabad and Kamptee, where they are far removed from the controlling authority, should be Engineers. But as respects all other executive officers we think the appointments may beneficially be opened to all branches of the army; and thus, out of the whole number of officers that we reckon to be necessary in the department, probably 36 will be other than Engineers.

Salaries proposed; the Inspecting Engineers.

540. It is proper that we should offer a few remarks with respect to the allowances which we have assigned to the several grades; omitting those connected with the new Board of Works, of which we have already spoken. To the Inspecting Engineers we propose to give, except in one instance, the same staff allowance that is now received by the Civil Engineers, with tentage, also at the same rate as at present, viz., *Rs.* 4 a day. The exception is the Presidency Division,

to which we propose to assign *Rs.* 1,000 staff salary without tentage. Including his allowance as Civil Architect, the Superintending Engineer of the Presidency Division receives at present a staff salary of *Rs.* 1,063. 10. 11.; the proposed Inspecting Engineer may be regarded as coming into his place, though his duties will be somewhat different, and somewhat more important. Comparing these functions with those of other appointments in the department, and considering the expenses of a Presidency residence, we consider *Rs.* 1,000 a suitable salary. The designation of Civil Architect may cease altogether.

The District Engineers.

541. The District Engineers may be regarded as coming in the place of the First Assistant Civil Engineers, except that their duties will be of a far more extensive and important character; and with this further material difference, that as the number of appointments in the lower grades is much increased, without by any means a corresponding augmentation in those of the higher ranks, officers will be much longer in reaching the post of Inspecting Engineer, than even now in attaining that of Civil Engineer. And yet promotion to this latter rank is even now extremely long deferred; and only a few months ago there were two officers of above 20 years' standing holding the subordinate appointment of First Assistant. A consideration of this tardy rate of advancement led the Board of Revenue to recommend very strongly in both the papers already quoted (Appendices G. and H.), that the First Assistant Civil Engineers should receive additions to their salary after certain periods of service. In the second of those letters they recorded the following just remark: "There are at present 14 subalterns of Engineers of 23 down to 15 years' standing; and it appears to the Board contrary to sound principle that all the professional knowledge and experience of such officers, who according to the custom of the service can only be employed in professional duties, should be reckoned at no higher value than that of some of the youngest in the corps, merely because they have attained no higher military rank." The arrangement recommended by the Board was to give the First Assistant Civil Engineers an increase of *Rs.* 100 a month after 10 years in the service; and a further increase of *Rs.* 50 monthly in salary, and one rupee daily in tentage, after 15 years' service. They preferred the mode of giving the increase for length of service, to that of constituting grades in the district appointments, on the ground that the latter plan would involve frequent transfers of officers from one district to another; but they propose that the increase should be always contingent on the recommendation of the Board.

It is necessary that their salary should be graduated.

542. The differing circumstances stated at the commencement of the foregoing paragraph, will render an increase in the scale of allowances for officers of this class much more necessary under the new arrangement than at present; and we think the scale proposed by the Board of Revenue too low. Upon that scale a District Engineer's emoluments, in a month of 30 days, would be as follows:—

	Staff Salary.	Tentage.	Total.
Of less than 10 years' service - - -	200	90	290
From 10 to 15 years - - - - -	300	90	390
Above 15 years - - - - - -	350	120	470

An officer of Engineers under this Presidency does not attain his Captain's commission in less than from 22 to 24 years; neither can he expect the post of Inspecting Engineer in less than 25. A monthly income of *Rs.* 704. 14., including all items,* and out of which the necessary expenses of marching equipage will absorb

	Rs.	*a.*
* Regimental allowances as First Lieutenant - -	234	14
Staff pay as proposed by the Board of Revenue -	350	–
Tent allowance, at *Rs.* 4 a day - - - -	120	–
Total - - -	704	14

absorb fully the allowance granted for that purpose, seems too little after 20 or 22 years' service, for the officers of a corps to which special advantages are held out, and which is cut off on account of such supposed advantages from a participation in the civil and staff appointments open to the rest of the army; and too little, we may add, for the arduous and irksome life which such officers must lead in order to do their duty efficiently.

Three classes are therefore proposed.

543. We differ from the Board also as to the mode which they propose, of granting the graduated increase of salary. The principle of giving such increase for length of service, even though conditionally on the favourable report of a superior, appears to us a bad one; it is the same of which we have already expressed our condemnation in the case of the Revenue Surveyors (*supra*, para. 41), after an examination of its results; and though its operation would not be exactly the same in the case now supposed, yet we cannot but think it bad here also. With reference to the Board's reason for objecting to a graduation by classes, we would observe that this system does not necessarily involve more transfers from district to district than any other system, for it is not necessary to attach particular classes to particular districts. Under any system such transfers must take place to some extent, for under any one, it would be necessary to have the most experienced and efficient men in the most important districts, and the juniors would as a general rule be posted to those of least importance. So also the most efficient and experienced men would be those selected for promotion, and thus an advance in salary might often accompany the transfer to another district; though the two events would be connected in time only, and not in the sequence of cause and effect. On the whole, the plan of classes appears to us to be decidedly the best, and the following is the scale which we propose:—

	Staff Salary.	Tentage per diem.	Total for a Month of 30 Days.
1st Class - - - - - -	500	3	590
2d Class - - - - - -	400	3	490
3d Class - - - - - -	300	3	390

We recommend that particular classes shall not be attached permanently to particular districts, so that promotion will not necessarily involve a change of district; and we shall recommend presently, that the designation of these officers to particular districts shall be left to the Board of Works.

The emoluments which we propose for the Assistant District Engineers are the same exactly as those enjoyed by the 2d Assistant Civil Engineers now; and no remark on them is required.

The Executive Officers to be in four classes.

544. We propose to arrange the Executive Officers also in classes, and on the following rates of allowances:—

	Staff Salary.	Tentage per diem.	Total Payments of 30 Days.
1st Class - - - - - -	600	- -	600
2d do. - - - - - -	400	3	490
3d do. - - - - - -	250	3	340
4th do. - - - - - -	150	2	210

In the permanent appointments we think it necessary to attach a particular class to each station; those of the occasional appointments will be determined in each case with reference to the magnitude of the work and the nature of the duties.

In the 1st class we propose only one appointment, viz., that of the Executive Engineer of the Presidency Division; the peculiar circumstances of this division already adverted to, seem to render a higher scale of allowances necessary here than up the country. In the 2d class there will be four appointments; viz., at Hyderabad, Nagpore, and two of those in the Saugor Division; in the 3d class seven appointments, viz., Bangalore, the Straits of Malacca, the Tennasserim Coast, Cannamore, the Neilgherry Hills, and two of those in the Saugor Division.

As to the occasional appointments, it is of course impossible to determine the numbers in each class; a large proportion may properly be of the 4th class, receiving only *Rs.* 150 staff salary. It may be assumed that of the 30 occasional Executive Officers, the number we propose to be usually engaged in executive duties, three may be of the 2d class, seven of the 3d, and 20 of the 4th. And as the emoluments of these last will be so low, it is the more desirable that as a general rule, appointments to the higher grades, even to most of those of a permanent character, should be filled by selections from these officers.

The Executive Engineer of the Presidency Division will require no tentage; in the other grade we propose that it shall be drawn under the limitations prescribed for the Maramut Engineers, at the rate of *Rs.* 3 a day for the 2d and 3d classes, and *Rs.* 2 a day for the fourth.

Promotion. The Board to distribute and transfer officers;

545. As to appointments and promotions among the officers of this establishment, it appears to us very expedient to take advantage of the knowledge which must necessarily be acquired by the Board of Works respecting the character and qualifications of the various officers employed, by bringing it to bear on the selection of officers for particular duties and for promotion. This principle is acted upon to a small extent, at present, the Board of Revenue being empowered to transfer the Assistant Civil Engineers from one division to another, as the exigencies of the public service may seem to render expedient; and the Government occasionally take the opinion of the Board in the appointment of the Civil Engineers. We think however that it ought to be carried further; and we beg to recommend that the duty of nominating District Engineers and Assistant Engineers to particular districts, as well as of nominating all the occasional Executive Officers to particular duties, should be reposed in the Chief Engineer and the Board of Works. We propose that the former shall lay before the Board a recommendation of an officer in every instance, with his reasons for the selection; and that the Board shall either make the nomination accordingly, or record their reasons for dissenting; and that in case of such difference the case shall be submitted for the orders of Government.

To recommend for promotion;

546. Again, with respect to all promotions of officers from one class or grade to another, the final decision in every such case must rest with the Government; but we propose that the recommendation shall emanate from the Chief Engineer, and shall be sent up to Government, accompanied by the concurrence or dissent of the Board of Works. And the same rule appears proper in the case of the designation of the Inspecting Engineers, and of the permanent Executive Officers, to particular appointments.

And to be permitted to recommend for selection from the line.

With regard to the selection of officers from other branches than the Engineers for employment on executive duties in the Public Works Department, that must be left as a general rule to the Government. But we beg to recommend that it should be fully recognised as the duty or the privilege both of the Chief Engineer and of the Board of Works, to submit to Government the name of any officer whom they may have reason to believe to be well qualified for those duties. To enable them to do this, we would further recommend that the Board should keep a record of the qualifications of officers desirous to enter the department. We would propose that any officer desiring it should be examined by officers nominated for the purpose by the Board, on subjects also specified by them, and that the report of the examining officers should be transmitted to the Board for their information and for record. We may add, that though it will be necessary to require in each candidate for such employment an acquaintance with the language of the locality, some knowledge of accounts, as well as a familiarity with some of the more elementary parts of engineering, yet that other qualities, not so readily ascertainable, are at least equally necessary in an officer engaged, as all the junior class of Executive Officers will be, in directing the exertions of large numbers of labourers; viz., laborious activity, readiness of resource, good temper and accessibility to all ranks.

We

We will only add here that we consider it very important that all officers in the department, whether Engineer or others, should take rank according to their position and standing in the department, and not according to their regimental or army rank. This is the practice in the Commissariat and other Departments, and it appears essential to the efficiency of the Public Works Department.

European Subordinate Department.

547. We must now offer a few remarks in explanation of our proposed establishment of European subordinates. In an earlier part of this Report (paras. 43, &c.) we have dwelt upon the excellent results obtained from the limited experiment already made, of the employment of European Overseers in the Maramut and Road Departments; and those results, and the qualities which the men have almost uniformly displayed, even under discouraging treatment, are such as to hold out the strongest inducement to the more extensive employment of this class of men, and in more important duties. We have already observed that men possessing attainments inferior to those of the Commissioned Officers, and, of course, on much lower salaries, may be largely made use of under the superintendence and direction of those officers, to perform duties which at present must either be performed by those officers themselves or be left undone. But at present no class of the natives of this country affords the materials for the formation of such a subordinate department; for men are not to be found possessing the activity, energy and fertility of resource on the one hand, and on the other, the straightforwardness and the superiority to intrigue and corrupt influence, which are not less required. It is absolutely necessary, therefore, that for many years to come the superior grades of the subordinate department should be almost exclusively European. The following is the establishment which we propose:—

RANK.	Class.	Number. In each Class.	Number. In each Grade.	Allowances Monthly. Pay.	Staff Pay.	House Rent.	Batta.	Compensation in lieu of Rations.	Total.	Allowances Annually. For One of each Class.	For each Class.
				Rs. a. p.	*Rs. a. p.*	*Rs. a. p.*	*Rs. a. p.*	*Rs. a. p.*	*Rs. a. p.*	*Rs. a. p.*	*Rs. a. p.*
Warrant:											
Sub-Engineers	1st	10	–	- -	250 - -	60 - -	121 12 -	- -	431 12 -	5,181 - -	51,810 - -
	2d	30	–	- -	150 - -	60 - -	91 5 -	- -	301 5 -	3,615 12 -	1,08,472 8 -
	3d	40	80	50 - -	- -	35 - -	91 5 -	- -	176 5 -	2,115 12 -	84,630 - -
Non-Commissioned:											
Overseers	1st	30	–	50 - -	- -	35 - -	60 14 -	- -	145 14 -	1,750 8 -	52,515 - -
	2d	30	60	30 - -	- -	30 - -	45 10 6	- -	105 10 6	1,267 14 -	38,036 4 -
Sub-Overseers	1st	32	–	26 7 4	43 15 1	- -	- -	6 5 4	76 11 9	920 13 -	29,466 - -
	2d	32	64	26 7 4	20 - -	- -	- -	6 5 4	52 12 8	633 8 -	20,272 - -
Total Warrant and Non-Commissioned		–	204	182 14 8	463 15 1	220 - -	410 14 6	12 10 8	1,290 6 11	15,485 3 -	3,85,201 12 -

To be divided into two primary grades; Sub-Engineer and Overseer.

548. It will be seen that we propose to divide this branch of the department into two principal divisions; viz., Sub-engineers and Overseers; each of which will be arranged in several classes. The duty of the Overseers, as already remarked, will be much the same as those of the same class at present; viz., to superintend the execution of considerable works; those of the Sub-engineers will be to assist the Engineer officers in all branches of their duty, by relieving them from the more detailed and mechanical parts of it. Thus their work will be strictly of an engineering character, and we have given them a designation suitable to their duties. Our design is, however, that this partition of duties shall not be absolute; but that it shall be open to the District or Inspecting Engineer to employ these subordinates in whatever manner may appear the best for the public service. Thus, occasionally, a Sub-engineer may properly be set to superintend the construction of an important work, just as Assistant Civil Engineers, and sometimes even Civil Engineers themselves, are so employed now. And, again, an Overseer may sometimes be charged with the duty of inspecting work after execution, or in performing the preliminary operations necessary to the decision of some important project, whether a ghaut, a line of road, a canal, or other.

A certain number of both grades will

549. We are well aware that the number which we propose in this grade, as well as in that of Commissioned Officers, is much larger than in the existing establishments;

be necessary for the ordinary duties of each division.

establishments; but we are persuaded that it is not at all larger than true economy requires. As with the Commissioned Officers, so also with the European subordinates, we propose that a certain number shall be permanently attached to each district for its ordinary duties, while others shall be maintained for more special works. The number of permanent appointments of each class, Sub-engineers and Overseers, has been fixed, after careful consideration of the wants of each district, with a view to the efficiency of the Maramut Department within it, comprising the following points: first, the careful selection of works for repair, and the judicious planning of repairs and preparation of estimates; second, the efficient execution of the more important works, whether of irrigation or communication, by the direct agency of the Overseers; third, an efficient control over the execution of the great majority of works which must still be left to native agents; fourth, the due inspection of work after execution, which is quite impracticable at present; fifth, the increased efficiency of all the works of irrigation, resulting from their being under the professional charge of a department numerically strong enough to attend generally to their improvement, which is now notoriously far from being the case; sixth, the improvement of the roads, by the operation of the same cause; seventh, the maintenance of the roads so improved.

And others must be provided for special works.

550. These ordinary duties will be found fully sufficient to occupy the fixed establishments proposed, so that none of its members could be withdrawn to other duty without loss; additional officers of this grade will, therefore, be necessary (as already said) for employment on those large special works, both of irrigation and communication, which we trust will hereafter be undertaken. To show the necessity for such a provision, it is only necessary to refer to the case of the Godavery improvements: these works have now been in hand five years; and in order to hasten them forward, officers, both commissioned and non-commissioned, have been largely withdrawn from other divisions (whence they were not taken without serious loss to Government), and all the ordinary duties, even of the 1st Division itself, have been almost totally neglected. By this very uneconomical means, and by entertaining several officers of the line as Assistant Civil Engineers, the number of officers of all grades on those works in March last, immediately before a large number were drafted away to the Kistnah anicut, was as follows: 14 Commissioned Officers, seven European Overseers, and five Revenue Surveyors; and yet, with this unusual assemblage of officers, enormous in comparison with the common means and with the state of other districts, and all directed by the untiring zeal and energy of the late Civil Engineer, Colonel A. Cotton, there has been very great loss of time (which in this case is truly money), for want both of officers and subordinates. Had there been a sufficient number of these, the greater part of the channels might have been already in operation; whereas, in fact, several of the main works, and almost all of the detailed works of distribution, still remain to be begun; and the loss of revenue from this delay cannot be estimated at less than 15 or 20 lacs. On this point we beg to refer to the several letters from Colonel Cotton (Appendices (C.), (D.) and (F.), especially para. 10 of the last named. Looking at these facts, at the long postponement of the Kistnah anicut and works from the same cause, and their necessarily slow progress even now, from the want of officers, involving a certain loss of revenue to a very large amount, and at the other various large and important works which remain to be undertaken, and a few of which we have enumerated above, (para. 537,) we think the number of Sub-engineers and Overseers that we propose for special works, viz., 20 of each, is not at all more than the necessities of a sound policy require.

Any not required at any time on such undertakings may be very profitably employed in attending to the great channels and tanks.

551. And even if at any time the services of the full number should not be required for such employments, there will be other most important duty for them. We have already said that the custody and management of individual important works of irrigation, and the economical distribution of their water, is one of the most important duties to be performed by the Subordinate Department. In our proposed establishment, however, we have abstained from making any special provision for that duty, because we feel wholly at a loss to specify the number of officers that would be required for it; the increased number of officers of all grades in the department, indeed, will do a great deal for the more economical management of works, for their visits to each one will be much more frequent and more careful than they can be at present. But even this will fall far short of the special attention which they require, and which would so well repay its cost. We think

think it of the greatest importance that such special provision should be made; and we believe that as the value of efficient superintendence in all its parts comes to be practically felt, it will be made. But what we have here to observe is, that if any of those subordinates whom we have provided for special duty in connexion with the new works projected are at any time without employment on such duty (which, however, will rarely or never be the case), then their services may be most profitably employed in this way; viz., in the careful and detailed examination and management of existing individual works of magnitude.

A certain number of Overseers are required for military works.

552. The foregoing are the numbers provided for employment in the Civil Department, including, however, the greater part of the military buildings in the divisions within the frontier, but away from the Presidency. Besides these, 40 officers of the non-commissioned grades are required for the duties of the Presidency division, and of the various military divisions and stations.

Certain native subordinates are to be attached to each European.

We may observe here, though we shall have to mention it presently, that, following out the principle of relieving the superior classes of officers from works which can be as well done, under their superintendence, by inferior and cheaper classes, we propose to attach a certain number of native functionaries to each European subordinate.

No subordinate establishment is proposed for the Mysore and Saugor territories.

It is proper to notice also in this place that we have not provided in our subordinate establishment, either European or Native, for the civil and general duties of the Mysore and Saugor Divisions, but for the military duties only. Our reasons for this omission are that those works are not conducted under the direction of the Madras Government, and also that we have not the means in either case of learning the amount of work to be done, or the wishes of the authorities controlling them. We have stated indeed the number of Engineer Officers required, in Mysore at least, that we might be able to form a judgment as to the whole requirements from that corps; but the number of the subordinates, both European and Native, can be enlarged from time to time as circumstances may require.

The organization of the European subordinate grades.

553. The gradation of ranks and rates of pay which we propose for the European subordinates in this department, have been arranged with reference to the existing organization of the subordinate grades of the Ordnance Department; as well as to that of the Public Work Subordinate Department in Bengal, and to the sentiments expressed by the Military Board of Bengal in their letter to the Government of India, dated 28th October 1845, on the subject. The whole number that we propose is 204; of whom 80 are to be Sub-Engineers and of warrant rank, and 124 Non-Commissioned Overseers and Sub-Overseers. In the former grade there are three classes. In the first class the total pay and allowance amount to *Rs.* 431. 12. monthly; in this class there will be only 10 appointments. The second class is to contain 30 officers; the aggregate pay and allowance of each being *Rs.* 301. 5.; the third class to contain 40 officers, the total emoluments of each being *Rs.* 176. 5.

Of the Non-Commissioned Officers there are four classes; viz., two classes of Overseers, and two of Sub-Overseers, with emoluments varying from *Rs.* 145. 14. in the highest class, to *Rs.* 52. 12. 8. in the lowest. Their salaries are arranged under so many different names, in order to be in keeping with the practice in the Ordnance Department.

The pensions also of the Warrant and Non-Commissioned grades of the new establishment should be similar in amount to those of the corresponding grades of the Ordnance Department.

Proposed course of promotion in these grades.

554. Admission into the lowest class of the Non-Commissioned grade will be given after the candidates shall have passed an examination, and produced certificates of sobriety and good conduct. They will rise to the rank of first class Overseer by seniority on condition of passing a certain fixed examination before each step. The Sub-Engineers, as already said, will require additional qualifications of a different kind from those which are sufficient to make a good Overseer. Promotion into that grade therefore will be from any one of the three Non-Commissioned grades, not at all by seniority, but by selection, and after the test of an examination suited to the duties of Sub-Engineer. So also the successive steps into the 2d and 1st class of Sub-Engineer shall be given by selection, and not by seniority; though, if the selections for the lowest class of that grade are properly made, it will rarely be necessary in practice to supersede men in the after promotions. It may be proper to require that every man before being made Sub-Engineer shall have

have been a certain time, perhaps three years, in the lower grade; and also that a certain time in the 3d and 2d class of Sub-Engineers shall be necessary to qualify for the class above it. In general the promotion will be much more tardy; and on the other hand, it may be proper to provide that in a very special case, it shall be competent to the Government to dispense with these restrictions, on the recommendation of the Chief Engineer and the Board of Works, and for reasons shown by them. Some more remarks on the subject of qualifications and promotion in this branch of the department will be found in the latter part of the following section.

It must be long before the establishment can be completed.

We may observe that the establishment which we propose cannot be completed for a long time, because it must require several years to produce the full number of men possessing the qualifications required in the higher grades. This of course is especially true of the highest class of all, and it is unlikely that that will be filled up for many years. But it will be expedient and wise to admit some individuals to those grades, even by some little relaxation of the requirements; in order to encourage the lower grades to exertion, by showing them that it is really the intention of the Government to complete the establishment as soon as properly qualified persons can be found.

What authorities to promote and recommend for promotion.

555. The whole of the men of the grades of which we are now treating will form one corps; their names will be borne on one list, and promotions must take place in the whole body, and not by divisions. We propose that promotions shall be made by the Board of Public Works on the recommendation of the Chief Engineer, and, in the case of Sub-Engineers, with the confirmation of the Government also, as those officers will receive "Warrants" from the Governor in Council. To enable the Chief Engineer to discharge his duty in this particular, he should receive periodical reports of the conduct and qualifications of every officer of these grades, which should be laid before the Board, with his recommendations for promotion. In the event of a difference of opinion between the Board and the Chief Engineer, the case to be submitted for the orders of Government.

We think that the same rule should apply to the appointments of individual officers of these grades to particular districts, or to special works, and to their transfers from one to another. Within the districts, their distribution should for the most part be left to the District Engineer, but subject to the control of the Inspecting Engineer and of the Board, when they shall see cause to interfere. As regards the selection of men for this branch of the department, we would give the same power to the Board of Public Works and to the Chief Engineer as in the case of the Commissioned Officers. We propose that men desirous to enter the Department should be examined under the orders of the Board, and that the reports of the examinations as well as of the conduct and character of such men should be sent to the Board; and that both the Board and the Chief Engineer should be entitled to recommend men to Government.

Natives and East Indians admissible to these grades, on certain indispensable conditions.

556. We have already said that under the existing emergent want, in this department, of European straight-forwardness and energy, as well as of the example to be afforded by the display of such qualities, appointments to this corps of subordinates should be confined almost wholly to men of European birth and education. At first this should be so strictly; but eventually the appointments may be somewhat thrown open. Thus we would recommend that the grade of Sub-Engineer should be held to be attainable by a Superintendent of Maramut, having displayed in a pre-eminent degree those qualities of zeal, energy, and honesty, which it is only fair to say that some few of that class have already evinced, and on passing the required examination.

Again, we would propose that hereafter, though not immediately, for the reasons already stated, East Indians shall be admissible to the grade of Assistant Overseers, and then compete for promotion on equal terms with their European comrades. But as the main reason for entertaining this European Subordinate Department is to gain those most valuable qualities to which we have before adverted, it will be absolutely necessary to insist on proof of the same qualities in the East Indian candidates admitted; and still more to insist on them prior to promotion. We fully recognize the principle that character and qualification are to determine salary, and not caste or colour; but to carry it into practice fully and fairly, those qualities must be brought to the test which cannot be categorically ascertained by an examination, like the possession of a given quantity of mathematical knowledge or handicraft skill, we mean those qualities of integrity and energy, which distinguish

guish the European from the native of India, far more than any difference of natural talents. When placed in this competition we fully believe (as we have already said) that the character and capabilities of the East Indian will be developed, and individuals will be found or produced, able to stand on the same ground with the European. Certainly the way to this competition ought to be opened to the East Indian; but then he must be required to display those qualities which alone render the services of the European so valuable.

The existing East Indian Revenue Surveyors, how to be dealt with.

557. Before quitting this part of the subject, we must explain how we propose to dispose of the existing number of Revenue Surveyors. At present there are 27 of the different grades of that establishment. But one of the number is the manager in the office of the Secretary to the Board of Revenue in the Public Works Department; where the services of a man in that capacity cannot by any means be dispensed with, whatever designation he may receive. A second assists in the office, and is also the teacher of the Survey School. Thus there are only 25 officers engaged on the proper duties of a Revenue Surveyor as we have described them above (paras. 37, &c.). Some of these are valuable men, intelligent, experienced and industrious; while others are the reverse; all of them however have been brought into the service by certain prospects of pay and promotion held out to them, and those promises must not be broken. We recommend indeed that contemporaneously with the organization of the new Subordinate Department, the establishment of Revenue Surveyors should be abolished. But the officers of that class then in the service must be retained; either they must be continued on the present terms, or they may be transferred (with their own consent) to corresponding grades in the new establishment In either case additional expense on their account will not be necessary. In the latter obviously not; nor in the former, for besides the fact that the new establishment cannot be completed for a number of years, a corresponding number of appointments in it may and should always be kept vacant, so long as any members of this extra establishment shall remain.

The native subordinates.

558. The following is our proposed establishment of Native subordinates:—

	Class.	Number in each Class.	Number in each Grade.	Monthly Pay. For one of each Class.	Annual Pay. For one of each Class.	Annual Pay. For each Class.
				Rs. a. p.	*Rs. a. p.*	*Rs. a. p.*
Supts. of Maramut	1st.	10	- -	120 - -	1,440 - -	14,400 - -
	2d.	10	20	90 - -	1,080 - -	10,800 - -
Deputy ditto	- -	- -	15	60 - -	720 - -	10,800 - -
Foremen	1st.	65	- -	40 - -	480 - -	31,200 - -
	2d.	85	- -	35 - -	420 - -	35,700 - -
	3d.	101	251	30 - -	360 - -	36,360 - -
Sub ditto	1st.	100	- -	25 - -	300 - -	30,000 - -
	2d.	100	- -	20 - -	240 - -	24,000 - -
	3d.	102	302	15 - -	180 - -	18,360 - -
Surveyors	1st.	40	- -	20 - -	240 - -	9,600 - -
	2d.	45	- -	15 - -	180 - -	8,100 - -
	3d.	52	137	10 - -	120 - -	6,240 - -
TOTAL	- -	- -	725	480 - -	5,760 - -	2,35,560 - -

Having already dwelt at some length (paras. 78, &c.) on the defects both in character and number, of the existing Maistry class, it is not necessary to speak of them here at much length; but we will briefly explain the new establishment which we propose. The necessity of increasing the number of Maistries in the Public Works Department has been repeatedly brought before the Government, and the inconvenience and loss resulting from their present defective numbers and character are experimentally familiar to all officers concerned in executing or inspecting works, and have been admitted both by the Government and by the Court of Directors. So long ago as February 1842, Major Hugh C. Cotton, then Civil Engineer of the 5th Division, comprising the Tanjore and Trichinopoly districts, wrote a letter to the Board of Revenue (at the request of Lieutenant-Colonel Sim, the Chief Engineer), pointing out the defects of the existing esta-

blishments, and proposing a new establishment on a larger scale, as well as a school for training Maistries.

Major H. C. Cotton's description of the Maistries.

559. This paper (which we give in Appendix I.) is well worth perusal. It is the production of an experienced officer, describing the deficiencies of the Maistry establishment as he had experimentally found them, and proposing those remedial measures which such actual experience suggested. Speaking of the qualifications of the Maistries he employs very similar language to that made use of by the Civil Engineers of the present day in describing the same class; and yet it must be remembered that he was writing of that division in which the Maistries were and still are better than anywhere else. Referring to a then recent order of Government directing that Civil Engineers should not undertake works till they had secured good superintendence, he writes as follows: "Were the Civil Engineer literally to fulfil the order, I am bold to say that scarcely a new work of importance in any of the divisions would ever be undertaken at all, unless the Civil Engineer confined himself to its superintendence, to the neglect of his other duties. No measures whatever are taken for the education of men for this very important and responsible line, and few indeed are found who have qualified themselves." "The situations are usually filled by men of the lowest grade of mind." "Without education, without natural talent (which would always find a better market in a thousand other trades or professions), without inducement to exert what talent or energy he may have, the Civil Engineer can never be justified under the present orders of Government in employing him to superintend works of any magnitude." Again he says, para. 5, "there is perhaps no expenditure in any department out of the public treasury, so badly economized as in the Department of Public Works, owing to the total inefficiency of the Maistries."

His scheme for organizing an efficient executive establishment.

560. With the view of remedying the defects of this class, Major Cotton recommended that their pay and their number should be augmented, and that youths should be systematically trained up for the duties. He considered it necessary that there should be a Maistry to every Talook, and a Superintendent of Maramut and a Deputy Superintendent to every district; also two Maistries under every Civil Engineer and one to every Assistant Civil Engineer and Revenue Surveyor; the total number of Maistries under this arrangement, including the Superintendents and Deputy Superintendents, would have been 349. The salaries which Major Cotton proposed were 100 rupees to the Superintendent, 60 to the Deputy, and from 35 to 14 rupees for the Talook Maistries; those of the Civil Engineers' Department to be paid somewhat higher.

The Board's proposal for the same object.

Major Cotton's letter was submitted to Government by the Board of Revenue with their own of the 15th February 1847 (Appendix H., paras. 63, &c.), when they stated their opinion that it was not necessary to go the whole length of his proposals, and submitted a scheme of an establishment numbering only 150 Maistries of all classes. We have no hesitation in declaring that this establishment was far too small for efficiency; and we are fully convinced that in thus limiting their demands the Board were actuated too much by a regard to the known indisposition of the Government to admit any enlargement of existing establishments. They deemed it hopeless to ask for a sufficient establishment, but they hoped by asking for little, to get that little. As it happens, this course did not succeed; the Board's application has not yet produced anything whatever, having only been referred backwards and forwards, as already said, between Madras, London and Simlah.

There are now still stronger reasons for improving the Maistries.

561. It is now nearly 11 years since Major Cotton's letter was written to the Board, and nearly six since it was laid before Government. The time that has thus elapsed has only served to show more clearly how truly economical it would have been to accept his whole scheme, how short-sighted is that policy which still keeps the Maistry class so inefficient; for it has afforded many examples of the saving effected, both of money and time (and time in this connexion means revenue), where energy, skill and honesty are brought to bear on the execution of work. Having the advantage of this experience, we must draw the requirements of true economy in this department on even a larger scale than Major Cotton did. It is true we have now European Overseers to superintend the more important works, and our scheme includes a larger number of them; but as the Board of Revenue truly observe in their letter already quoted (Appendix G., para. 65), the great mass of works must still remain dependent on the Maistries. Even as respects

respects the common duties of this class we are satisfied that a candid consideration of the few statistical details which we have already given of them (paras. 76 & 77), will vindicate the establishment that we propose; and if, as we trust, the time has now arrived when something effective is to be done for the formation of roads and the extension of irrigation, the improvement and enlargement of the Maistry class are absolutely essential. The course of instruction to be proposed in the succeeding section will, we trust, ensure the former object, and we will now notice the plan which we propose for the latter.

Proposed number of Superintendents and Deputy Superintendents of Maramut.

562. There are now 15 Superintendents of Maramut in the same number of districts, leaving five districts without that very useful class of officer. We fully agree in opinion with Major H. Cotton that a Superintendent is required in every district. There are also three Deputy Superintendents, or Head Maistries, as they are sometimes called, but it appears to us that the number of this class also ought to be enlarged, and we propose to entertain a Deputy Superintendent in each of those 15 districts where there is most work to be done.

Proposed number of Maistries for the districts.

As respects the Talook Maistries there are at present only 97 for the 256 Talooks. We fully agree with Major H. Cotton that there ought certainly to be one to each Talook. With the view of elevating the position of the Maistry, we also propose, as we have observed in another place, that the Maistries shall be borne on the establishment of the Collector's Office, not on that of any particular Talook, and shall be appointed to the charge of particular Talooks from time to time, as may be found expedient.

The name of Maistry to be changed.

563. There is another change which will cost nothing, and which, though unimportant in itself, we recommend as tending greatly to increase the respectability of this class, and that is, to change the designation of the office. The term Maistry is used in common speech in connexion with building, to signify a head bricklayer or head carpenter; in a wider sense it is employed to designate a head gardener, head bearer, &c. All these characters are men living by bodily labour, receiving daily hire, of low caste, of no education, and often of low habits. The Maistries of the Public Works Department have usually been taken from the bricklayer class, and it must, unfortunately, be confessed that but few of them have done much to elevate the title. Bad as the pay and prospects have been in this line, we believe that the mere name has had not less effect, from the association of ideas, in deterring respectable and educated men from entering it. Again, the duties of the appointment having been almost totally changed since Maistries were first entertained (*see* above, para. 75, &c.), the name is now quite inapplicable. In organizing a new establishment, it seems highly expedient to discard the old and ill-esteemed name, and adopt one expressing the duties of the office, distinctive as regards other appointments in the department, and not associated with degradation. We have chosen that of "Foreman," as the most suitable that has occurred to us; and we propose that the higher three classes shall be styled Foremen, and the lower three Sub-Foremen. The duties of these two grades will generally be divided as indicated above in para. 87. For the Talooks and for the Engineer Officers men will chiefly be taken from the higher grade; those attached to Sub-Engineers and Overseers, and those employed exclusively in executive and mechanical duties, will for the most part be of the lower. The lowest class of all will usually be in immediate attendance on Overseers, as noticed in the next para.; and in the way of gaining instruction and experience from them.

Others must be attached to the European officers and subordinates.

564. Besides the Maistries or Foremen of the Talooks, others must be attached to the various grades of European officers, just as European subordinates are appointed under Commissioned Officers, and for similar reasons. They will perform duties, which under the eye and the control of a superior, they can do as well he, and so will multiply the results of his labours; and they will also do sorts of work requiring an amount of exposure to the climate, to which, even from a regard to economy only, a European ought not to be subjected. Thus, when a European officer, of whatever grade, is executing a work, it will be proper that he should avoid the mid-day sun; and employ himself during that part of the day on his accounts; but his Maistries may be on the work all day, directing the operations, with as little injury as the labourers themselves; and the same with other sorts of work. A sufficient provision of inferior officers of every grade is true economy; and one great defect of the existing system is an unwise parsimony in this particular. To every Overseer allowed for the Maramut Department, for the main roads, and for special

special works, we propose to allow one Foreman or Sub-Foreman, who will, in fact, be a subordinate Overseer under him, and will greatly enlarge his powers of superintendence. To all other European Officers we assign one Foreman, and also one "Surveyor," a class of which we shall speak presently. Of course this allotment will not be peremptory and invariable; the actual distribution of the Maistries will be modified from time to time according to circumstances. Thus, an officer or Sub-Engineer engaged on a large work, or in charge of a line of road, will require, and will be able efficiently to control, several native subordinates; and these may then be furnished to him by withdrawing them from other officers engaged on works requiring fewer of such assistants. The total number of Foremen required to supply the officers under the foregoing rule will be 251, as seen in Appendix (E E.). There are also 46 provided for military works at the various military stations; this is about the same number that are employed at present, as no material increase of number seems to be required there, but only the better education and training of the men, which will be effected by the school, and a more systematic organization. Thus the total proposed number of Foremen and Sub-Foremen for all purposes will be 553.

Proposed rates of salary.

565. We have already said, in remarking on the Maistry establishment in a former section, that their pay requires to be increased; and our proposed list provides what appears to us to be necessary. We propose to have two grades of Superintendent on *Rs.* 120 and *Rs.* 90 a month respectively; the Deputy Superintendents to be all in one class, at *Rs.* 60. The Maistries or Foremen to be in six classes, as already said, ranging from *Rs.* 40 a month down as low as *Rs.* 15.

The native subordinates to be entitled to pensions.

We of course suppose that the native members of the establishment will be entitled to pension under the general rules, as those of the existing establishments are. In the eye of a native the prospect of a pension is of great value, and will make up for much deficiency of present salary. Without such a prospect the scale of pay which we propose would certainly fail to raise this department to that position in relation to others, which we consider essential to its efficiency. We cannot but observe, that some relaxation in the existing rules regulating the grant of pensions appears expedient, especially in this department. At present absolute physical disability is required; and even after the pension is given, if a committee, assembling a year after, thinks the recipient has any more work in him, the pension is withdrawn. There is much difference also between sedentary employments, which require only eyesight and the power to sit up and use the hands, and those of which the duties can only be performed by men in the full possession of their physical and mental energies. But medical officers fail duly to discriminate between these classes, and in their fear of the subsequent committee, will hardly grant a certificate of incapacity at all. The consequence of this rigour is very hurtful to the public service; for men are consequently retained in the situations of Serishtadar, Tahsildar, Superintendent of Maramut, and Maistry, who are quite unfit for the active and laborious duties of those offices; as a consequence, the work is badly done, and both the Government and the people suffer.

In what authorities the promotion and appointment of these classes to be vested.

566. We think that promotion into the grades of Superintendent and Deputy Superintendent should be made by the Chief Engineer and the Board of Public Works, on the periodical reports and the recommendation of the Collectors and the Inspecting Engineers, in a manner similar to that already recommended for the European subordinate grades, and also that their appointments and transfers to particular districts should be made in the same manner. But we are of opinion that both the promotion and the distribution of the various classes of Foremen must be left in the hands of the local officers, as that of the Maistries is at present. This course appears to us to be necessary to the effective and vigorous working of the system, which would be hampered by too much centralization of power in this particular. We would propose, therefore, that the establishments of the several Collectors and District Engineers should be fixed to contain a certain number of each class. The distribution of those of the Engineer Department (except those immediately attached to the Inspecting Engineer), to vest in the District Engineer, subject to the general control of the Inspecting Engineer; their promotion to vest in him, subject to the special approval of his superior officer. Both the distribution and the promotion of those of the Collector's establishments, to vest in the Collector; who will generally, however, consult the Engineer Officers on such arrangements.

567. The

567. The next class in the establishment are the Surveyors. Our reasons for creating this new class are similar to those which lead us to enlarge the Maistry or Foreman class; officers engaged in surveying and levelling a tract of country, with the view to the tracing of a road or of a pass, or the planning of a channel or a tank, have much work to be done which can be done quite well under their superintendence, by men who can do nothing else, and who can perform with accuracy the mechanical part of the work, without any knowledge of principles. It is true economy, therefore, to employ such men, so as to save the time of the more highly paid officers. We propose that every Engineer Officer and every Sub-Engineer shall have one Surveyor attached to him. The Surveyors will go through a certain course in the school to fit them for their duty. There will be three classes, on *Rs.* 10, *Rs.* 15, and *Rs.* 20 respectively. After serving a few years in this grade, it will be open to the Surveyor, on the favourable recommendation of his superior officer, to re-enter the school, and go through the course and pass the examination necessary to qualify for a Foreman. The promotion of the Surveyors to be subject to the same rules as that of the Foreman. The Surveyors.

568. It does not appear necessary to say much on the subject of the office establishments. The details of the scheme will be found in the Tables already referred to, Appendices (D D.) to (F F.). The establishments assigned to the Presidency offices are precisely the same as now exist; not that we intend to signify that no change is needed: but, 1st, Because though the establishment of the Board of Revenue in the Public Works Department is now certainly too small, yet that of the Chief Engineer's Office seems to be larger than necessary; and, 2d, because until it is determined how the business is to be conducted, and what functions are to belong to the Board of Works and what to the local authorities and officers, it is impossible to say what strength will be required in the Board's office. We propose to increase the strength of the District Offices in this department, by giving a small establishment at the Collector's office, and a Gomastah or Accountant in each Talook. We are far from saying that this is sufficient; but it will be a material improvement on the present establishment, and with systematic management and an improved system of accounts, it may generally suffice to get through the duties. We also propose some addition to the strength of the office establishments of the Engineer Officers in the Provinces. The office establishments.

We will only add that we have assigned a Gomastah or Native Writer and Accountant to every Superintendent and Deputy Superintendent. We do this for the same reason already stated more than once with reference to the higher classes; viz., because to require those officers to copy their own papers, and calculate the whole of their own estimates, &c., is waste of their highly-paid time. Even at present this sort of assistance is given to them, we believe, in most districts in some way or other; and where it is not, we are persuaded that, for economy's sake, it ought to be. The pay assigned to these Gomastahs is very small, though sufficient; and the whole charge on this account will be trifling.

Section X.

On the proper Means of providing and training a succession of Officers for the Public Works Department, of all grades, Commissioned and Subordinate, European and Native.

569. We have next to consider the best means of providing and of educating and training the various classes of officers required to form an efficient establishment in this department. We will begin with the commissioned ranks. At present the country is entirely dependent for engineering skill on the small corps of Engineers which forms a part of the army. But a material increase of Engineers in the Maramut Department is absolutely necessary. And it becomes an important question whether it will be best to provide them by enlarging the existing corps: or whether, leaving that at its present strength, a separate body of Engineers should be constituted for civil duties, without military commissions or organization. The question is one to be decided on the joint consideration of efficiency and of cost. Whether the present Military Corps to be enlarged, or a Civil Corps formed.

570. As to cost: at first sight it might appear that a body of mere Engineers without any sinecure offices must necessarily be the cheapest. But, it is to be remembered Their relative cost.

remembered that the expectation of the Colonel's commission and the off-reckonings, is virtually a part of the emoluments of every officer in the corps; and inasmuch as every man naturally takes a too favourable view of his own expectation of life and success, this prospect is worth more than the actual amount of a Colonel's allowances would be, if distributed as addition of salary among all the officers. Again, in a military corps, forming a member of a large army, and in a country where military rank is much thought of, the very holding of a commission, and even the military title, have no little value; and thus the place of salary is supplied *pro tanto* by the cheaper commodity, honour. On the other hand a new body of Civil Engineers would occupy no recognized *status* in society. Individuals would in time achieve a position for themselves; but others not so undeniably possessing personal claims, and not having the prestige arising from connexion with a highly honourable body, would sink, and find themselves in a painfully equivocal position. And unless the body generally were to be left in an inferior rank in society, their pecuniary emoluments must be increased to give them that consideration which the command of money confers. Further, the supposed Civil Corps must be provided no less than the military with absentee allowances on occasion of sickness, with furloughs, and with retiring pensions; and it does not appear that these could be fixed at lower amounts respectively than those enjoyed by the Engineer Officers.

Their relative efficiency.

571. Then as to efficiency: it is true that in a seniority service promotion is lost as a stimulus to exertion; but though the commissions in the Engineer Corps go exclusively by seniority, the appointments do not by any means in the same degree. Even in a non-military body, length of service must and always would be allowed some claim, quite as much as it need receive under the existing system; and indeed we cannot but think it a better working principle on the whole, and as a general rule, than that of selection.

Again, the members of a Civil Corps must be entertained and brought out to this country at an early age, and must be received permanently into the service; both because acquaintance with the languages and with the peculiar engineering works of India, can best be learned early in life, and also because no man having entered on a line of employment at home and established a connexion and character, would abandon his prospects and come out to India, without such large inducements as could not be held out generally. There would still, therefore, be the same chances as at present of some men turning out unfavourably.

Best to augment the present corps.

Looking at the whole question, the occasional mistakes in selection, or partiality of nomination, the high and increasing money value of engineering skill at the present time in England; and especially bearing in mind the high tone of honourable feeling which characterizes the officers of the Engineer Corps: we are decidedly of opinion that the best plan to effect the object in view, the cheapest and the most effectual, will be to extend the present system, rather than to adopt the alternative of entertaining a separate body of Civil Engineers.

Another alternative; selections from the line.

572. But it may be suggested by some that even admitting the necessity for an increased number of Engineers for civil duties, it is neither necessary to augment the present Engineer Corps nor to entertain a separate body of Civil Engineers; but that the additional strength required may be obtained by selection from the officers of the line. But we must emphatically record our protest against any such plan, as we are satisfied it could only end in failure and disappointment.

Such officers would have all their business to learn, and at the expense of the State.

Even supposing no officers to be so selected except such as had been at Addiscombe, very little could be thus obtained in the way of science. For even the mathematical acquirements of the Infantry Cadets leaving that institution are generally very small; and as to engineering, the Engineer Cadets themselves hardly acquire so much as its rudiments till after they have left Addiscombe; and those for the Infantry cannot be supposed to have learnt anything of it all. Officers thus nominated, therefore, would still have everything to learn; in the course of years those possessing natural aptitude for the profession would no doubt acquire some skill, but in estimating the relative cost of the two systems, it must be remembered that during all this time they would have been receiving pay as Engineers, and also that such knowledge as they might ultimately gain would have been purchased by a succession of failures, the cost of which would have fallen on the Government and on the public.

And the requisite number could not be so procured.

But even supposing this objection, fatal as we deem it, to be overruled, there would be much difficulty in procuring officers with even a limited amount of fitness

for

for the duty. This difficulty is experienced even in selecting for the comparatively simple and easy duty of superintending work. It is by no means every officer whose services would be worth his salary even in that capacity; and in point of fact, the drafts from the line for the ordinary staff appointments are so heavy, and there are so many regiments in which the proportion of officers permitted by the regulations are already on the staff, that frequently an individual officer selected as fit for the employment cannot be obtained.

A third consideration, an important one, though not strictly within the scope of our subject, is that the efficiency of the regiments of the line must suffer when their best officers (for the hypothesis must suppose the best, both as to intelligence, activity and steadiness), are thus systematically withdrawn to other duties.

Such a plan would act prejudicially on the line.

573. In short here, as elsewhere, it will be found the best and the cheapest policy to employ scientifically educated men for scientific duties. This is even more necessary, indeed, in this country than in England, because there a large amount of science and skill is spread throughout all ranks of the community, which is almost wholly wanting in India. It has never been proposed to recruit the medical service by drafts from the officers of the line; and yet such a scheme appears hardly more unreasonable and opposed to common sense, than to depend on the same source for the formation of a body of Engineers.

It is best to employ scientific men on scientific duties.

The foregoing remarks are not intended to apply to the employment of unscientific officers in executive duties, such as superintending the formation or the repair of a line of road or of a ghaut. In such situations their services have often been very valuable, when they have been carefully and judiciously selected for their special aptitude for the work. They are more particularly wanted where a work is so large as to involve the expenditure of larger sums than it would be right to entrust to a Warrant or Non-commissioned Officer. We have already observed, however, that it is by no means easy always to find fit men available; and the selections made have certainly not been happy in all instances.

The foregoing remarks not intended to apply to executive duties.

574. Supposing it to be determined that the wants of the country for professional science and skill, shall be met by enlarging the Engineer Corps, the next point to be considered is what amount of augmentation is necessary for that object. We have already noticed most of the demands upon the Corps of Engineers, but must here offer a few remarks on the Sappers and Miners. This corps was formerly styled Pioneers, and was officered from the Infantry. In 1831, one of the two battalions of Pioneers was broken up, and the other was re-organized as a corps of Sappers, with a view to its being officered by Engineers. The Commandant and the Adjutant have accordingly been uniformly from that corps; but such has always been the paucity of Engineer Officers, and the urgent demand for them for other duties, that it has very rarely happened that there have been more than those two attached to the Sappers, except when on actual foreign service. This statement, however, is exclusive of the young officers of Engineers attached to the Sappers on first arriving in the country, for the purpose of going again through the course of instruction which they had already studied at Chatham, and to learn a native language.

The Sappers and Miners.

575. The Commander-in-Chief has informed us, through the Adjutant-General, that he considers it necessary for the efficiency of the Sappers corps that it should always have present with it eight officers of Engineers; viz., a Commandant, an Adjutant, and an officer to command each of the six companies. Captain Rundall, who commands the corps, considers a still larger number of professional officers to be necessary; he says, "To secure the perfect efficiency of the corps of Sappers and Miners, in my opinion, there should be permanently with it at least two officers to every company, besides the Commanding Officer and Adjutant; that is, 14 Engineer Officers in all; and that it would still further contribute to the efficiency of the corps, if there were always at the depôt two juniors to supply the place of casualties, making 16 officers in all. The present system of officering from the line is but a choice of evils, and was only recommended and adopted as such, in the present dearth of Engineer Officers, in order to furnish the largest number possible to the Department of Public Works. It is not found to work so well, even as was expected." But though we quite agree with Captain Rundall that two officers with each company would be better than one, we are not prepared to recommend the addition of six more officers to the strength of the Engineer Corps for that purpose only; a great increase on other accounts is absolutely necessary, and we

Number of officers necessary for that corps.

may rest on the authority of the Commander-in-Chief that the corps would be effective in time of peace, if in addition to the Commandant and Adjutant, it had an Engineer Officer commanding each company, with a second junior officer from the line.

List of appointments requiring to be permanently filled by Engineer Officers.

576. The following then is a list of those appointments, which, as it appears to us, ought for the benefit of the public service to be held by the Engineer Officers only:—

Chief Engineer	1	Officers for Special Projects	9
Adjutant	1	Executive Engineers	5
Member of the Board of Public Works	2	Commandant of Sappers	1
Secretary to ditto	1	Adjutant of ditto	1
Inspecting Engineers	13	To command six companies of ditto	6
District Engineers	24	Principal of the Engineering College	1
Assistant District Engineers	20		
		Total	85

One-fourth of the Officers of Engineers are absent on sick certificate and furlough.

577. But in order to determine what ought to be the strength of the corps in order to furnish this number of officers present for duty, it is necessary to consider what proportion will generally be absent on furlough or on medical certificate. And the annexed table, based on information obtained from the Adjutant-General, shows the state of the Engineer corps in this particular on the 1st May of each of the last 16 years:—

YEARS.	1836.	1837.	1838.	1839.	1840.	1841.	1842.	1843.	1844.	1845.	1846.	1847.	1848.	1849.	1850.	1851.	TOTAL.	Average.
Present	34	33	33	30	26	26	26	28	30	34	38	41	41	39	43	48	550	—
Europe Sick Cert.	5	8	9	10	8	6	5	4	5	5	5	6	6	4	3	3	92	—
Cape and Sea Sick Certificate.	–	–	–	1	1	1	1	1	1	–	2	3	1	2	2	–	16	—
Total Absent Sick	5	8	9	11	9	7	6	5	6	5	7	9	7	6	5	3	108	—
Europe on Furlough	3	4	4	4	4	4	5	2	3	4	3	1	2	3	5	5	56	—
Furlough in India	7	2	2	–	2	4	2	4	3	2	–	–	–	3	1	1	33	—
Total on Furlough	10	6	6	4	6	8	7	6	6	6	3	1	2	6	6	6	89	—
Total Absent	15	14	15	15	15	15	13	11	12	11	10	10	9	12	11	9	197	—
Fixed Establishment	40	40	40	40	40	40	40	40	40	46	46	46	46	46	46	46	682	—
Supernumerary 2d Lieutenants.	9	7	8	5	1	1	–	–	2	–	2	5	4	5	8	11	68	—
Wanting to complete.	–	–	–	–	–	–	1	1	–	1	–	–	–	–	–	–	3	—
Total on the Rolls	49	47	48	45	41	41	39	39	42	45	48	51	50	51	54	57	747	—
Per Centage of Absentees on the whole Strength:																		
Europe Sick Cert.	10·2	17·02	18·75	22·22	19·51	14·63	12·82	10·26	11·90	11·11	10·41	11·76	12·	7·84	5·56	5·26	–	12·32
Cape and Sea Sick Certificate.	–	–	–	2·22	2·44	2·44	2·36	2·56	2·38	–	4·16	5·88	2·	2·92	3·70	–	–	21
Total Sick	10·2	17·02	18·75	24·44	21·95	17·07	15·38	12·82	14·28	11·11	14·57	17·64	14·	11·76	9·26	5·26	–	14·46
Furlough to Europe	6·12	8·51	8·33	8·89	9·75	9·75	12·82	5·13	7·14	8·89	6·25	1·96	4·	5·88	9·26	8·77	–	7·49
Furlough in India	14·28	4·26	4·17	–	4·88	9·75	5·13	10·25	7·14	4·44	–	–	–	5·88	1·85	1·75	–	4·42
Total Furlough	20·4	12·77	12·50	8·89	14·63	19·5	17·95	15·38	14·28	13·33	6·25	1·96	4·	11·76	11·11	10·52	–	11·91
Total Absent	30·6	29·79	31·25	33·33	36·58	36·57	33·33	28·2	28·56	24·42	20·82	19·6	18·	23·52	20·37	15·78	–	26·92

Thus it is seen that the average proportion of officers absent from duty is very nearly 27 per cent.; but of this per-centage, 4·46 represents those absent on furlough in India, a term, which includes all leave for places in India given by the Government, or by the head of the army, whether on medical certificate or on private affairs. It comprises, therefore, some cases of absence of a temporary character,

character, such as do not need that the place of the absentee should be supplied; but these are not many, for it is a well-known fact that Engineer Officers, having always full occupation, rarely take leave on private affairs, and in their case the greater part of the leave under this head is certainly on medical certificate, and of such length as to require the appointment of a substitute. It may safely be assumed that fully one-half of it is of that description, and then the proportion of absentees to be provided for will amount to nearly 25 per cent.

The proportion would be larger except for the presence of many supernumerary 2d Lieutenants.

578. And we must not omit to notice a peculiarity found in a considerable part of the period on which the per-centages are taken, and which unduly lowers the proportion of absentees; that circumstance is, that in eight out of the sixteen years in the table, the calculation is powerfully affected by the presence on the regimental rolls of a large number of Supernumerary Second Lieutenants, in some years amounting to nearly a fourth of the proper strength of the corps. This necessarily diminishes the proportion of absentees; because these supernumeraries swell the number on the roll, but they are not entitled to a furlough to England. and they contribute very little to the absences on medical certificate. This is observable in the earlier years of the period, in which the proportion of absentees is materially less than in those which follows; and still more in the latest years. In some of the very last, also, the number of absentees is even absolutely less than the average. The diminished number of furloughs to England may be partly owing to the increasing slowness of promotion, under which fewer officers have the pecuniary means of taking their furlough. But we are unable to assign a particular cause for the whole effect observed, and we believe it must be referred for the most part to that general law of variation and uncertainty, which is the very reason why it is necessary in all such inquiries as the present to draw conclusions from averages rather than from particular cases. It would obviously, therefore, be unsafe and deceptive to regard those few years as showing the normal condition of the corps.

A table showing the numbers absent in all the several branches of the army.

579. In endeavouring to form a judgment as to the proportion to be allowed for absence from duty, it may be useful to show here the actual state of the case in the other branches of the army; and we accordingly append a table prepared from a more detailed statement obtained from the Adjutant-General, showing the number of absentees on the several kinds of leave, from the various branches of the army, and their proportion to the whole strength. This table extends over the same 16 years as that for the Engineer Corps given above; but it gives only the total results, and not the details of each year:—

On what Description of Leave.	Engineers.			Artillery.			Cavalry.			Infantry.			Total.		
	Total Strength.	Absent.	Per Centage.	Total Strength.	Absent.	Per Centage.	Total Strength.	Absent.	Per Centage.	Total Strength.	Absent.	Per Centage.	Total Strength.	Absent.	Per Centage.
Europe Sick Certificate - -	747	92	12·32	2,265	256	11·30	2,492	278	11·16	19,586	2,075	10·60	25,090	2,701	10·77
Cape and Sick Certificate - -	747	16	2·14	2,265	16	0·71	2,492	19	0·76	19,586	212	1·08	25,090	263	1·05
Total out of India on Sick Certificate - - -	747	108	14·46	2,265	272	12·01	2,492	297	11·92	19,586	2,287	11·68	25,090	2,964	11·82
Furlough to Europe - - -	747	56	7·49	2,265	141	6·22	2,492	245	9·83	19,586	1,150	5·87	25,090	1,592	6·34
Furlough in India - - -	747	33	4·42	2,265	53	2·34	2,492	226	9·07	19,586	1,553	7·93	25,090	1,865	7·43
Total Furlough - - -	747	89	11·91	2,265	194	8·56	2,492	471	18·90	19,586	2,703	13·80	25,090	3,457	13·77
Total Absent - - -	747	197	26·37	2,265	466	20·57	2,492	768	30·82	19,586	4,990	25·48	25,090	6,421	25·59

Facts exhibited by the table.

580. This comparison shows that the proportion absent is largest in the Cavalry; that the Engineers come next, the Infantry third, and the Artillery last. But on looking more closely, it is seen that of the absentees from the Cavalry, 18·90 per cent. of the whole strength are on furlough to England or in India, and only 11·92 per cent. are absent from the country for the recovery of their health. In the Engineers, on the other hand, the great bulk of the absentees are such as have been driven from the country by temporary failure of health; no fewer than 14·46 per cent. of the whole strength are absent from this cause, while the absentees from other causes are only 11·91 per cent., and even this includes (as already explained) a considerable proportion, and much larger than in the Cavalry,

Cavalry, on Medical Certificate in India. The fact is, as respects private leave in India, that the Engineers and the Artillery being regularly occupied by their duties, rarely apply for it; while the Infantry, and still more the Cavalry, having much more leisure time, avail themselves of it more largely. As to the furlough to England, the Cavalry, from their superior emoluments, are able to take advantage of that privilege much more generally than the other branches of the army, especially than the Infantry.*

Another fact developed by the same Table deserves notice, viz., the large proportion of Engineer Officers absent from the country on medical certificate, compared with the other branches of the army. The proportion of those so absent in that corps is higher by one-fifth than in the Artillery or in the Cavalry, and higher than in the Infantry by nearly one-fourth. And we must again repeat, that except for the presence of a very undue number of youthful officers, the proportion in the Engineers would be even higher than is here shown. This striking difference against the Engineer Corps appears clearly to be owing to the large amount of exposure to the evil influences of the climate (both solar and malarious) which is essential to the efficient performance of the duties of very many of the Engineer appointments, particularly of the whole of those in the Tank and Road Departments. This exposure is a necessary incident of the service; and it will be but little diminished by the augmentation of the corps, or even by the improved efficiency of the subordinates of the department.

Number of Engineer officers required.

581. Thus looking at the past experience of the Engineer Corps itself, we are led to the conclusion that nearly one-fourth of its whole number of officers will commonly be so absent from duty as to need to have their places filled up; and when we refer to that of the other branches of the army, we find it such as to confirm this conclusion. To obtain therefrom the proper strength of a corps of Engineers competent to furnish a given number of officers always present for duty, we must add to that number one-third of itself; and thus to supply 85 officers for duty, we require a corps of 112 officers.

Proposed organization for the corps.

It appears to us that this number may properly be organized in four battalions, each to be composed as follows, viz., one Colonel, one Lieut.-Colonel, one Major, eight Captains, 12 First Lieutenants and five Second Lieutenants, which would give a total of 112 officers. In the Infantry there are three officers of and above the rank of Field Officer to 21 below that rank, being one to seven; and there are six Captains to 15 Subalterns, or one to two and a half. The organization above proposed, gives a smaller proportion of officers of and above Field rank, being one to every $8\frac{1}{3}$ below it; but in compensation, a somewhat larger proportion of Captains to Subalterns, viz., one to every $2\frac{1}{8}$.

The number of officers specified only provides for absolutely necessary duties.

582. The number of officers which we propose is 66 more than the present fixed establishment, and 55 more than the actual number on the 1st May 1851, which included 11 Supernumerary Second Lieutenants. The increase is undoubtedly large, but we are satisfied it is not more than is actually required, and we feel it to be our duty not to shrink from stating the conclusion at which we have arrived. We beg to call attention to the fact, that in enumerating the officers required to be always present, we have mentioned only those wanted for duties strictly belonging to the Engineer Corps, viz., for the Sappers, and for the Public Works

* From the constitution of the service, almost all the Colonels of all branches of the army are constantly in Europe on unlimited furlough, and in order to compare the numbers absent on furlough in the usual and proper sense of the term, the Colonels ought to be omitted. The comparison will then stand as follows:—

	Engineers.	Artillery.	Cavalry.	Infantry.
Whole number absent on Furlough to Europe	56	141	245	1,150
Deduct Colonels	27	61	93	534
Remaining other Ranks	29	80	152	616
Total Number of Officers on the Rolls excluding Colonels	715	2,163	2,364	18,710
Per Centage on Furlough to England in the grades below Colonels	4·05	3·7	6·43	3·29

Works Department, strictly so called. We have allowed no officers for miscellaneous duties, which, however, will often form drafts on the corps; none for the appointment of Mint Master, or Member of the Military Board; none for the Magnetical Observatories or other purely scientific researches; none for a Revenue Survey, though when that most important work is undertaken, as we trust it will be before long, it must be under the direction of at least one Officer of Engineers, besides Subordinates of the department; neither have we allowed any officers for employment under the Resident of Travancore, though it is understood that the Government are in a manner bound to supply such aid, and it is also much required; nor have we allowed any for district or executive duties in the very extensive Saugor and Nerbudda territories; and lastly, we have not made any allowance for those young officers who must be under instruction, and learning a vernacular language, at the head-quarters of the Sappers or elsewhere. With respect to the last item, we know that six or eight officers must always be so employed; and as to the rest, that calls will constantly be made on the corps for one or another of these duties; we are aware that the corps as proposed by us can only furnish officers for all these various demands by diminishing the number of Assistants to the District Engineers, or in other words, by shortening the valuable course of practical instruction which young officers will pass through before being put in charge of a district themselves; we feel that this will be an evil, but we prefer to encounter it rather than to lay ourselves open to the charge of including in our list any appointments not absolutely required, and not absolutely needing to be held by Engineers.

To the exclusion of many others for which Engineers will certainly be taken.

583. Again, we must observe also, that we have carefully excluded from our list of employments for the Engineer Corps all duties not requiring professional science and skill. In the immediate execution of large individual works of all kinds, and in the management of departments charged with executive duties, there will be many situations in the Public Works Department eminently demanding intelligence, probity, energy, and prompt resource; but except where such duties are peculiarly extensive, or where the professional superior is far distant, and except also the occasional employment of Assistant District Engineers in the immediate execution of works for their own better practical education, we have assigned the whole of such duties to unprofessional officers, by whom, we believe, if carefully selected and directed, they will be very efficiently discharged. But here the employment of such officers must stop; we are fully pursuaded that it is true economy to confide professional duties solely to professionally educated men.

And of mere executive duties.

584. We have arrived at the conclusion above stated as to the number of Engineer Officers necessary, from the sole and simple consideration of the wants of the public service. We would not add so much as a single officer to our list upon any mere consideration of establishments existing elsewhere. But it may be useful, nevertheless, to draw a comparison between the strength of the Engineer Corps at this Presidency and at the other Presidencies of Bengal and Bombay, in order to show that the increase which we advocate is not extravagant in the comparison.

The number in Bengal and Bombay.

Prior to 1824, the strength of the Engineer Corps of the three Presidencies had not been determined on any fixed principles; but in that year all three were re-organized. Each was to contain two battalions; but the organization was somewhat different in Bengal from what it was at Madras and Bombay, so as to give a total of 46 officers to the former Presidency, while each of the others had only 38. The wisdom of allotting the same strength to Madras and Bombay, and of making so little difference between these two and Bengal, when the requirements of the three cases differed very largely, is not apparent. It was soon found, however, that the number of Engineers allotted to Bengal was quite insufficient, and a third battalion was given to that Presidency in 1827, raising the total number of officers to 69. In 1829 a revision of this arrangement took place, and the strength of a battalion of Engineers for all the Presidencies was then fixed at 20 officers; and thus the Bengal Corps was reduced to 60, while those of Madras and Bombay were both raised to 40.

585. In 1839 a further enlargement of the corps took place in Bengal. In that year the Court of Directors sent out a despatch (20 March, No. 14) declaring that they had long been anxious that the whole of the operations connected with buildings, roads, canals and surveys should be exclusively under officers of Engineers; and pointing out that at that time, though all the officers of that corps (including 12 supernumeraries) were employed on professional duties, yet that such were the

Augmentations in Bengal.

exigencies of the service, that 26 officers not Engineers, were also employed on the same duties. Deeming this an unsatisfactory state of affairs, the Honourable Court proceeded in the same despatch to direct that the strength of each battalion of Engineers in Bengal should consist of 29 officers, as noted in the margin, by which the whole strength of the corps would be raised from 60 officers to 87. And the Court expressed a hope that, by a careful attention to the mode of employing this number, the Government would shortly be relieved from the necessity of confiding duties of a professional nature to officers not specially educated for that branch of the service. The corps continued on this organization till 1844, when a further change was made. The Honourable Court had become dissatisfied with the arrangement of 1839, because it broke in on the system established in 1823, of giving to all branches of the service equal proportions of Field Officers and Captains. They resolved accordingly (despatch 3 July, No. 5) that the Corps of Engineers in Bengal should consist of four instead of three battalions, each to contain 23 officers, as shown in the margin; and thus the total strength became 92.

1 Colonel.
1 Lieut.-Colonel.
2 Majors.
6 Captains.
12 1st Lieutenants.
7 2d Lieutenants.

1 Colonel.
1 Lieut.-Colonel.
1 Major.
5 Captains.
10 1st Lieutenants.
5 2d Lieutenants.

Changes at Madras.

586. In the same year a change was made in the organization of the Madras Engineers. Since 1829 that regiment had consisted of two battalions of 20 officers each; but in 1844 (despatch 27 November, No. 68) the organization then recently introduced in Bengal was ordered to be adopted at Madras also, and thus six subaltern officers were added. The Court at the same time declared their intention to add four more officers to the corps at an early period, and to determine when doing so, in what ranks the addition should be made. It does not appear how this intention could have been carried into effect, without a direct violation of the principle so lately enunciated in the case of Bengal; and in point of fact, the promise was never redeemed; no addition has been made to the Madras Engineers from that day to the present, except by the objectionable expedient of sending out every year a large number of supernumerary Second Lieutenants.

We may here observe, that we are aware that in the scheme given above in para. 581, for giving the required augmentation of the Engineer Corps, we have departed from that principle of uniformity which, as it appears from the despatch, constituted the principal reason for giving the Bengal Corps a fourth battalion in 1844. It appears to us that such rules, however good in themselves when applied with discretion and moderation, become an evil when pushed to the extreme, and allowed to operate as a bar to useful measures. On this consideration we have arranged the strength which we consider necessary, in four battalions, so constituted as to compensate by a larger number of Captains, for a smaller proportion of Field Officers and Colonels. If, however, the existing organization is to be rigidly adhered to, the number of battalions may be increased to five of the present strength; the total number of officers would thus be 115, and the number always fit for duty 86, a number certainly not too large for the demands of the public service.

Proportion of the Engineers to the rest of the army, under all the Presidencies.

587. As a branch of the army, the Engineer Corps may properly be compared with the other branches; and this comparison is the more appropriate as a test of the work which it has to do in some important departments of its duty, because the buildings required for an army are in proportion to its strength, and because the army bears some proportion to the extent of the territory and to the scale of the other establishments; and, therefore, this comparison affords some criterion as to the number and value of civil buildings, and the extent of the communications of the country.

The Comparison of the Three Presidencies in this respect is shown in the annexed Table.

	Battalions of Engineers.	Other Branches:				Number of the Battalions of other Branches to one of Engineers.
		Battalions of Artillery.	Battalions of Infantry.	Regiments of Cavalry.	Total.	
Bengal - - -	4	12	78	10	100	25
Madras - - -	2	7	56	8	71	$35\frac{1}{2}$
Bombay - - -	2	5	33	3	41	$20\frac{1}{2}$
	8	24	167	21	212	27

Thus

Thus it is seen, that in the Bombay army the battalions of Engineers are to the battalions of the other branches of the service as one to 20½; in the Bengal army as one to 25, while in the Madras army they are only as one to 35½. Or to state the same facts in other terms, the Engineer battalions at Bombay are 4·65 per cent. of the number of battalions in the whole army, Engineers included; in Bengal they are 3·84 per cent.; while at Madras they are no more than 2·74 per cent.

The irrigation works of this Presidency require a large number of Engineer Officers.

588. But this is not the only point of comparison. In Bengal, almost the whole of the land revenue is permanently settled; and throughout the whole Presidency, both Bengal Proper and the North West Provinces, there are scarcely any Government works of irrigation; and in the Bombay territories the works of that description are still more few and insignificant. Whereas, in Madras, as before explained, by far the greater part of the land is held on annual and Ryotwar settlements; irrigation is very general, and the charge of repairing the irrigation works has been assumed by the Government, together with the annual contributions levied by ancient custom for that special object: and in proportion as that duty is well or ill performed, the amount of revenue collected varies very materially. Thus, whereas, under the other Presidencies, the operations of the Engineers are chiefly confined to the large military stations and to the main lines of road, they extend in this Presidency to the works of irrigation scattered about in almost every village of the country. And the same cause, viz., the existence of the works of irrigation, works demanding a principal share of the attention of the Engineer Corps, also raises the expenditure requiring their control and management, much above what it would be without such works. This peculiar circumstance of this Presidency, viz., the existence and the nature of the Government irrigation works, is alone fully sufficient to show that Madras requires, in fact, a larger proportion of Engineer Officers than the other Presidencies; whereas it has, in fact, a much smaller proportion.

Comparison with the other Presidencies.

589. Compared with the other departments of the army, the increase which we advocate as absolutely required by the public service at this Presidency, would only raise the proportion here to what it is already at Bombay; while it would give Madras a somewhat higher proportion than is now possessed by Bengal. But compared with the work to be done, which after all is the only proper point of comparison, the establishment at Madras, even after such augmentation, would still be far below what it is at either of the other two Presidencies; for besides the large quantity of very important work in connexion with the irrigation, which is almost wholly wanting at both the other Presidencies, the extent of roads required in Bengal is very far below what it is here (compared respectively with the extent and population of the two countries), because, both in the Lower and even in the Upper Provinces, the rivers are the great highways. The reasons why, with the much larger amount of work to be done, we ask for this comparatively limited number of Engineers, are two; viz., first, that with an efficient subordinate establishment, such as we propose, a given number of Engineer Officers will be able to accomplish a vast deal more than they could without such assistance; and, second, we propose, as already said, that all merely executive functions shall be discharged by officers to be selected from the line.

Even with the proposed augmentation the number of Engineers will be very small.

590. In making this comparison with the other Presidencies we are far from saying that the existing number of officers in Bengal especially, is sufficient for the multifarious and important duties devolving on it in those very extensive territories. With that question we have no concern, we have only to consider the wants of this Presidency; and having done so with the utmost care, and having rigidly excluded all appointments not requiring professional skill, we cannot rate the requirements of the public service at a smaller number than that which we have stated. And we feel confident that no man acquainted with the circumstances of the country, or candidly considering the facts as we have stated them, will maintain that we ask for more than is necessary. For what is it after all that we propose? Every District Engineer will have charge on an average of a territory of 7,000 square miles, which is equal to the whole of North and South Wales; and this extensive charge will comprise thousands of works, contributing each in its degree to the revenue of the Government and to the wealth of the people, and requiring each in its degree the care and management of the Engineer Department; in each district also thousands of miles of road are to be traced and made, or

mproved and kept in repair; and each one also contains Government buildings, civil and military, to a very great value. The Inspecting Engineers again will have charge of a tract of country of more than double this extent; viz., on an average above 16,000 square miles, and their tours on duty will not be confined to simply travelling along the high road to visit the chief stations, like the Inspecting Engineers in Bengal, but they will have to travel from time to time into every remote corner of their extensive divisions, in the investigation of projects of improvement and the inspection of work done. To these two grades of officers we may add eight of the Assistant District Engineers, being, probably, fully as many as will in general, under our proposed arrangements, be of sufficient standing and experience to be of real use. And thus we have 37 Engineer officers as the whole number actually engaged in the custody and management of all the numberless works of this extensive and populous country; viz., all the works of irrigation, and the roads and canals, besides the Government buildings, being one such officer to every 3,900 square miles of country, and to every 600,000 of its 22,000,000 of inhabitants. And the exertions of this very small number are expected to be sufficient to maintain the revenue derived from irrigation, to develop the resources of the country by pointing the way to the improvement of those works and of the internal communications, and to eradicate fraud and peculation from the very extensive native executive department.

And it would be more reasonable to condemn that number as insufficient than as extravagant.

591. When the actual facts as thus stated are duly weighed; when the small number of professional officers that we propose is compared with the huge extent of the territory, the enormous number of works to be attended to, and the vast importance of the interests at stake, we are convinced that instead of deeming the proposed establishment extravagant, every candid person will feel that it is far below what is required, and that it is hopeless to expect such large results from such limited means. We are persuaded that this view would be far more just than its opposite; and while we fully believe that with the aid of an efficient subordinate establishment much may be accomplished by the amount of professional agency which we seek for, we are yet convinced that in the course of 10 or 15 years after that augmentation shall have been given, when the value of an effective department shall have been practically demonstrated, and the importance of improving and maintaining both the works of irrigation and the means of internal communication shall be more fully recognized, it will be urgently felt that the number of officers is still much too confined, and that a further material increase is required, simply as a matter of economy.

Proposed order of raising the additional strength.

592. We have said that the wants of this Presidency in Engineer Officers cannot be met by a smaller augmentation than would be equivalent to two strong battalions, besides a corresponding increase to the present two battalions; and we think the facts which we have stated fully support that statement. But it may be doubtful how far it would be wise or expedient to give the whole of that increase immediately. To do this by the usual means would add a large number of very young officers to the corps, who for some years to come would necessarily be without the experience which is required to form a valuable Engineer Officer. The Madras Engineers have been so extensively superseded in both Bengal and Bombay that probably no assistance whatever could be obtained from either of those corps in forming an additional battalion here, but even without such extraneous help the standing of the officers generally is such, and the number of supernumeraries is so large, that the corps might be at once completed to three battalions of the full strength above proposed, without any inconvenience. The proper strength of the regiment at present is 46 officers, but the actual strength, with nine supernumeraries, is 55. The whole number necessary to form three battalions on the scale proposed is 84, and 29 additional officers would thus be needed to complete the present establishment to that strength; being not a larger proportion of quite young officers than must generally be found on the occasion of such an augmentation. As respects the remaining battalion it occurs to us that the best plan will be to raise it gradually in the course of the six years next after the first battalion is given; adding one-sixth of the strength in each grade every year, as nearly as it can be arranged. The subjoined scheme might answer for this purpose.

	First Year.	Second Year.	Third Year.	Fourth Year.	Fifth Year.	Sixth Year.	Total.
Colonel - - -	–	–	–	–	–	1	1
Lieutenant-Colonel -	–	–	–	–	1	–	1
Major - - - -	–	–	–	1	–	–	1
Captains - - -	1	2	2	1	1	1	8
First Lieutenant - -	2	2	2	2	2	2	12
Second Lieutenant -	1	1	1	1	1	–	5
Total - -	4	5	5	5	5	4	28

Thus the augmentation would be spread over several years, and the inconvenience of a large number of very young and inexperienced officers, and of too rapid promotion, would be avoided.

Supernumerary 2d Lieutenants of Engineers.

593. Before quitting this subject we cannot but briefly notice a practice to which we have already adverted; viz., that of increasing the numbers of the Engineer Corps by sending out a large number of supernumeraries in the grade of Second Lieutenant. The return for the 1st May 1851, shows 11 officers of that description; at the present moment there are nine, and the number appears to range from eight to 12. This practice seems to have been in vogue 18 or 20 years ago (*see* the Table above in para. 577), but to have been afterwards abandoned until recently taken up again. It appears to have been adopted now in consequence of the pressing requisitions sent home by the Madras Government for an increase in the number of professional officers. But it is a mode of meeting that want not only unfair in the extreme of the Cadets so sent out, but certain to be ultimately injurious to the efficiency of the corps, and through that to the interests of the Government, from the feeling of disappointment and disgust with the service, to which it must give rise.

The prospects held out at Addiscombe are falsified.

594. A Cadet at Addiscombe is excited to use all his exertions to obtain a commission in the Engineers, by representations of the great superiority of a young officer's prospects in that corps over those of a brother officer in the Artillery, or in the Line; but no sooner does the successful competitor arrive at Madras, than the illusion is dispelled. He finds himself posted as tenth or twelfth supernumerary, with the prospect of from five to six years' service in that grade, before he is even brought on the strength of the regiment. Nor are his ulterior prospects of promotion less dismal; in the highly favoured Cavalry there are six Captains to twelve Subalterns, or one to two; in the Infantry there are six Captains to fifteen Subalterns, or one to two and a half; in the Artillery there are five Captains to fifteen Subalterns, or one to three; and nominally the same proportion exists in the Engineers, but in point of fact there are five Captains in the latter corps to twenty Subalterns, or only one to four. Thus the young officer's chance of promotion to Captain in the Engineers is one half worse than in the Cavalry, three-eighths worse than in the Infantry, and one-third worse than in the Artillery; and not only this, but half his time as Subaltern is passed in the inferior grade of Second Lieutenant, while only one-third of it is so in the other branches.

In reply to a remonstrance from some Madras Engineer Officers some years ago, complaining of slow promotion, the Court of Directors justly observed that they could not recognize, as ground of complaint, circumstances which depended on the contingencies of the service. But that plea ceases to be valid when the supersession is not an accidental circumstance, but is the consequence of the Court's own acts, in unduly increasing the junior ranks of a regiment in breach of their own established regulations.

The Addiscombe system of instructions good.

595. We have only a few remarks to offer as to the education and the training of the Commissioned Officers of the department.

To begin with the Addiscombe education, we believe that the whole management of the Cadets at that Institution is excellent. The most talented masters are secured by high salaries, the military discipline is beneficial to the pupils, the subjects

subjects of study are so well varied throughout the day, that the greatest number of hours are occupied without injury to the health of the boys. And, altogether, no better use could probably be made of their first two years. At the end of each term, so many of the senior boys as the wants of the three Presidencies render necessary, are appointed to the Engineers; and as they have won their way to that position step by step through the Academy, by fair examination, nothing could be more honest than the selection. There is, however, one fault in the test by these examinations, which we will bring to notice, though we do not feel ourselves able to suggest a remedy. The selection, as it is now made, is by the amount of rudimental knowledge possessed by the candidates, and not so much as might be by their talent or capacity; whereas, the main points, at so early an age especially, to be determined in the Engineer recruit are, his aptness to acquire knowledge, and his power of applying it to the duties of his profession.

But the selections for the Engineers defective in one particular.

596. It may be thought that the amount of mathematical and other acquirements possessed by each Cadet after his course of study is completed, is the best criterion of his capacity for learning, but such is by no means the case. The preparatory schools which now almost entirely supply the Engineer Corps with the recruits, drill their boys in the exact line they have to walk through Addiscombe, (the path that leads to an Engineer Commission), which gives them so great an advantage over those who are untrained in that particular line, that the two years spent in the Academy does not give time enough for talent to win its proper place; and the consequence is, that the well-crammed pupil leads the class, and is appointed to the Engineers whether he has any turn or not for the profession. There can be no doubt that the longer the youths remain together in the school, the better chance each will have of proving his ability, and probably the defect which we are speaking of, could only be corrected by a longer stay at Addiscombe; but it is possible that something might be done by bringing more fully to the test the power the candidates possess of turning to account the knowledge they have acquired. This, however, we must leave for the consideration of those practically skilled in education.

A longer course of Civil Engineering is necessary.

597. After leaving Addiscombe, one year or 15 months is spent at Chatham in the study of Military Engineering, with a very flimsy course of Architecture and Civil Engineering. Here we would recommend a most decided change, limiting the military course to six months, and giving a year-and-a-half, or two years, to practical instruction under a Civil Engineer, engaged on some important work; and we may here observe, that so far back as 1838, the importance of this was so strongly felt, that the Government resolved (on the 20th March of that year,) to recommend to the Honourable Court of Directors to make Civil Engineering in future the primary object in the education of their Engineer Cadets. In the medical service, the young officers who have given their minds to the study of their profession in Europe, bring out practical knowledge, which could hardly be learnt from books, and each year something of modern improvement is thus brought to India. The same will be the case in the Engineer Corps if our recommendation on this point is followed. The military course might very well be condensed, and the more time that is allowed for the study of Civil Engineering in all its branches, the better; no course of study could be more improving, and the very fact of the Engineer Cadet remaining in Europe till he is old enough to know the real value of all he sees, will of itself be of great importance to the corps which he is to join in India. As a stimulus to those under this course of instruction, we would suggest that their relative position and standing in the Engineer Corps should be determined, not as at present by the Addiscombe examination, but by an examination after the close of their civil engineering studies.

The course of instruction in India.

598. On the arrival of the young officers at Madras, they are sent to the headquarters of the Sapper Corps in Coorg, where they go through a course of plan-drawing and estimate making, in the forms in use in India. They teach and practise with the Native and European Sappers some of the military engineering learnt in England, and have the advantage of a Moonshee in either Hindoostanee or Tamil. They remain at Mercara till they have passed an examination in some one Native language, after which they usually receive the appointment of Assistant to a Civil Engineer.

Its defects.

This most important year in the young officer's life does not appear to us very satisfactorily employed, although they do pass it at present under the orders of a

most

most zealous and efficient Commandant. We consider a period of service under Military discipline in India as wholesome and advisable for young officers; and there ought also to be an advantage in their remaining under military orders while studying the language; but still, the results of the present system are not in all respects good. Its great faults seem to be, that while attached to the Sappers, the young officers are not engaged in any great work of interest, and that the mess consists of very young officers; and the natural result may be traced in a decided distaste for the Civil branch of the department on leaving Mercara, and a consequent want of interest in their work.

The means of correcting them.

599. To correct these defects, we would recommend that the head-quarters of the Sappers should be always stationed at one of the most important works under execution, in whatever part of the country that might happen to be. In such a situation, as at Roorkee in North India, the study of Engineering would be carried on to the greatest advantage, both to officers and men; the practical being intimately combined with the theoretical, so as to illustrate it, and give it an interest and relieve it of its dryness, by showing its use in actual work. Again, even if there should be no older officers of Engineers attending the mess, still officers of all ages from the corps would be engaged on the work, and would form a society in which the juniors could not but learn, as nearly all do later in their lives, that there is the highest interest to be found in Civil Engineering. We would relax nothing of the military discipline, would make the study of a native language of still more importance than it is at present; would give to the European and Native Sappers all the benefit of the Military and Civil Engineering knowledge brought out by the young officers; and would let all see it applied as far as possible to the work under execution. It has always been remarked, that men who showed little or no taste at first for the laborious duties of the department, have learnt to take a pleasure in their work, on such great undertakings as the Coleroon or Godavery anicuts, where they have found their seniors making the furtherance of the works their sole object, and the progress of each day the boast of all engaged. Every Civil Engineer would be glad to get assistants from such a school as that; there being this difference between young men so trained and those now sent out after the usual course at Mercara, that one is a useful assistant immediately, and the other not till he has acquired some practical acquaintance, both with the novel species of works which are to engage him, and with the people with whom he is to be in constant intercourse. On joining a division at present, if an officer has come direct from the Sappers Corps, he has still much to learn, and all the department being overworked with most unedifying routine duty, it is long before he has gained the information necessary for an independent charge of duty requiring Engineer's skill. He will not learn probably in years, what he would acquire in six months if employed to assist in the execution of some extensive work.

Parties of Sappers employed on public works, to be under the Board of Public Works.

600. We would also recommend that portions of the Sappers employed on public works, whether the head-quarters or detached companies, should, while so employed, be placed entirely at the disposal of the Government, as is the case with officers holding appointments in the Public Works Department. Under such an arrangement they would be under the general control of the Board of Works, which must be the proper authority to decide where and how their services could be most beneficially applied. In this case the charge to the Public Works Department would be the working money, and other expenses not purely military. The Sappers Officers of the party, or some of them, might be appointed Assistants to the Engineer Officer of the work or of the Division, or Executive Officers under him; and this would add to their emoluments, and give them a feeling of interest in the work. On the Sappers themselves, we think the effect of this change of arrangement could not fail to be beneficial. Their practical teaching would go on as at present, with this great advantage, that they would feel themselves to be labouring for a real object. Instead of doing work and then undoing it, first throwing up entrenchments and field works and then destroying them, an occupation peculiarly dull and uninteresting, they would see the utility of their labours, and would consequently work with increased zeal and energy. To the State also there would be a gain; for the immediate results of the men's labour would be valuable instead of entirely useless; and, lastly, the spread of handicraft skill among the labouring classes generally from working with the Sappers, would be a great public benefit.

Acquisition of a native language important.

601. Much stress should be laid on the necessity of acquiring a native language. And as the corps of Sappers is entirely composed of men who speak Tamil or Teloogoo, and one or the other of those tongues is the language of 18 out of the 20 districts of this Presidency, while Hindoostanee is but the language of a few persons thinly scattered, it would be better to teach the two former almost exclusively.* It is no doubt agreeable in moving from one part of India to another to be able, by a knowledge of Hindoostanee, to make oneself intelligible to some one at every considerable station or town; but to a Civil Engineer on duty, who should be in the habit of familiar communication with the most common Ryots, Hindoostanee in South India is almost wholly useless. Many of the servants of the district Cutcherries can use it generally, and so can most of the Peons, and all the Sepoys in the public bungalows; and officers familiar with that language are too apt to rest content with a direct communication with those classes only, and to use interpreters in their much more important intercourse with the people of the country. Under these circumstances we would recommend that every young officer should be obliged to acquire a good knowledge of either Tamil or Teloogoo while with the Sappers; and we would have that study made of more importance than all others in the course of instruction there, which does not appear to be the case at present, as very few young officers are now able to speak any native language tolerably when they quit Mercara. On joining a division, a slight acquaintance with the language of the district is required before the allowance of First Assistant can be drawn. This is a beneficial rule; but as there is very little time for study, if the officer appointed is to do the duty of an Assistant, choice should be made for each division as far as possible from those who have already learnt the language of it whilst with the Sappers, and with a view to that, the numbers taught each language should have reference to the probable demand for Engineers in the northern and southern districts.

Duties of a Sub-engineer.

602. We now come to the classes below the rank of Commissioned Officers; and in treating of them, we will first make a few remarks so far as it may appear necessary, as to the qualifications required in the several grades, and then explain the mode of training for these classes, which appears to us to be the best.

The Sub-Engineers will take all the important duties of the present Revenue Surveyors, and will in reality be Assistants to the District Engineers. They will usually travel independently of their superior officers, and have to act for themselves even in cases of considerable importance. They will visit from time to time as many as possible of the public works, and report upon their actual condition in all particulars. They will also examine work executed, comparing it with the accounts furnished by the Executive; decide on the value of labour and materials; and remark on the efficiency of the work, as well as the results of former outlay. It will in like manner be their duty to estimate for repairs, to examine estimates made by the Revenue Department, to suggest improvements for the better security or extended utility of the public works, and to give instructions as to the manner of executing work and preparing materials, so that the greatest economy may be ensured in all that is done. In some cases they will take executive charge of works too extensive to be left to the management of one Overseer, or where more than one Overseer may be employed without a Commissioned Officer being present.

The qualifications he requires.

603. The Sub-Engineer will thus need the following qualifications. A character above suspicion; a practical knowledge of building, and an acquaintance with the principles of Engineering, with reference both to hydraulic works, especially those of this country, and to the construction of roads, canals, bridges, &c. He must be a good practical Surveyor, must have some considerable knowledge of mathematics, must understand arithmetic thoroughly, and be able, either by tables, or formulæ, to determine superficial and cubical contents, as well as the pressure and velocity of water, under different circumstances. It will also be requisite, that a Sub-Engineer should have the power of communicating what he sees and does, in good clear English, and possess such a knowledge of the language of the district as shall enable him

* There are two other languages extending over considerable tracts, besides mere local dialects; they are Canarese and Malayalum. The former is spoken in the greater part of Canara, in a small part of Bellary, and in the Mysore country; Malayalum is the language of Malabar and of the Rajahship of Travancore and Cochin. These languages should be studied by a limited number; Malayalum is much like Tamil, and Canarese a good deal resembles Teloogoo.

him to communicate with the people of the district, or at least to detect an error of interpretation. There can be no doubt that the class best able to supply this grade at present, is that from which our Overseers are now drawn. And we consider it most advisable, for reasons given elsewhere, that a considerable number of Europeans should be appointed to it as rapidly as possible.

Duties and qualifications of an Overseer.

604. The Overseers will have the same duties as are usually entrusted to the same class now. They will manage works under execution, teach the use of English tools, and aid the executive in introducing a better system of work and more perfect materials. The Sub-Engineers will for the most part be selected from this class; but it may be expected that many most excellent Overseers will never qualify themselves for the higher grade, in those studies which are not easily taken up late in life. A man of good character, who understands building, and commands the respect of those who work under him, will be an invaluable Overseer even if he has no other qualifications, and for the first few years we must be satisfied to place such men upon our list; but in organizing the department we do not think we need limit ourselves to so low a standard for the future, if the pay and promotion we recommend is guaranteed to those who take service in it. We have no doubt that either from Her Majesty's, or the East India Company's, Corps in India, or by enlistment in England, respectable young men may be procured who have learnt some useful trade, and had such an amount of education that after a year or a year-and-a-half devoted to the particular studies suited to the department, including the nature and management of our peculiar hydraulic works, and the acquisition of a native language, they will be fully qualified for the place of Overseer, with a fair prospect of rising to the rank of Sub-Engineer. In the present state of the country, when a better knowledge of the arts is so much needed, it would be well if all who were selected for the Public Works Department could be such as have been brought up to some art required in building; but high character and general intelligence are of even more importance, and we would not therefore restrict enlistment to artisans. A man of intelligence will gain in two seasons of actual work, sufficient practical knowledge of building to make him a most valuable aid to an Executive Officer, under whose orders he will, while usefully employed, complete his education as an Overseer.

Recruits for this department how to be obtained.

605. The recruit for the Overseer Department may be either enlisted in England, or selected from European corps in this country; but there is a disadvantage attached to the present plan of taking them from the Sappers. It is found useful to retain the men on the strength of the army, so that in case of misconduct they may be remanded; a useful secondary punishment, short of the extreme penalty of dismissal. In the Sappers, however, as there are no European privates, a man goes back as a Non-Commissioned Officer; and the present advantages of the Overseer's appointment are so small, that some men actually wish to be thus remanded. A second evil is, that under this system the Non-Commissioned ranks of the Sappers are kept up far beyond their proper strength.

With an establishment increased as we propose, it would probably be found impossible to obtain a sufficient supply of men from the regiments in India. We think also that much is to be gained by enlisting men in England, because by that means the department will gain by the advantage of the superior prospects which it can hold out, in comparison with what other branches of the service can offer, and men would freely enter for this department of a stamp to be met with very rarely in the ranks of a regiment. We would propose then that the advantages of the department should be made known at the depôts, and that men should be enlisted for it, but should be enrolled in the Artillery or the Infantry, and with the liability to be remanded to such corps as privates, in case of misconduct. At the same time we would by no means close the door against soldiers of the regiments in India, but would advocate the cordial admission of all such as came up to the required standard. There is one advantage attaching to this class, viz., that their characters are generally well known. The men already in the Sappers Corps should also be admissible; the prospect of such employment was one of the conditions of their enlistment; and they are of the same class as those Overseers whose conduct has been so praiseworthy, and whose services so valuable.

Engineer's writers.

606. The Writer in the Engineer's office should be capable of examining estimates and accounts, and writing English rapidly and well; he should read and write the language of one or both of the districts in the division, and be familiar with the

terms and symbols used in surveying and plan-drawing. As he may frequently be of use in the examination of works, the more practical knowledge he has the better; and as he will have to do business on a somewhat equal footing with the Tahsildars, it will be essential that he should be a man of some standing in the service, and of that unquestionable respectability which enables a man in office to be independent of caste.

Estimate makers.

The officer in the Engineer's office heretofore styled "Maistry," has been in fact a calculator and maker of estimates; he has usually the estimate department in the office, examining those which come from the Collector, and entering abstracts of them in the books; and he has the checking of the bills sent in. His duties however are heterogeneous, for from the scantiness of the Civil Engineer's establishment, he has been required, in addition to the foregoing office duties, to accompany the Civil Engineer in his out of door inspections, and aid him in taking measurements for estimates or in measuring works executed; occasionally also, he is employed in surveying or taking levels. We propose to give every Engineer a Foreman, as already stated, who will take the latter portion of the Maistry's duties: for the former part we propose to give him an "Estimate maker." He will require a familiarity with English as well as with the language of the division, and he must be a good accountant and calculator, and thoroughly acquainted with the mode of making estimates and bills.

Draughtsmen.

607. The Draughtsmen will be employed solely in drawing fair plans and surveys. Hitherto this duty has usually been done by the Revenue Surveyors at a great unnecessary cost; not only from the high salary paid to that class, compared with what need be paid to the most expert Draughtsman, but also from the men engaged in drawing being kept constantly marching. It may be supposed how much labour and time is lost when unfinished drawings on large sheets of paper have to be packed up every day for travelling, and the work is to be done in the bad light of a tent, on tables never either firm or level. To correct this we would have all finished drawings made in an office kept at the head-quarter station, where the most may be made of time, labour and materials; while the Draughtsman, being relieved from the expense of travelling, would be well paid on half the salary that would be necessary for him if following the camp. Nothing but extreme accuracy and neatness being required in copying plans, many men who have not a talent for other studies, or strength for the Surveyor's duties in the field, may excel in it; and if we may judge from the beauty and minute correctness of detail, in the paintings of those who have been employed by the botanists and ornithologists in the country, no race of people would make better or cheaper Draughtsmen for the Engineer Department, than the natives of the South of India.

Surveyors.

608. The only other grade which we will here notice is that of the Surveyor. The mere operation of surveying is almost wholly mechanical, requiring little more than carefulness and patience; and it has been found by actual trial that native youths, carefully taught, will make more accurate surveys than are usually turned out by the Revenue Surveyors of the Civil Engineer's Department. And if copies are made of these surveys, by such Draughtsmen as we propose to employ on from *Rs.* 20 to 35 a month, the drawings will be more perfect than the generality of those that we have on our records now, and will cost only about a fourth of the price. For it has hitherto been the false economy of the Government in the Public Works Department, not only to grudge all suitable education, but by keeping establishments at too low an ebb, to employ the same man to copy a plan, who was paid on the supposition that he had skill enough to project the work.

The advantage of employing natives on the mechanical parts of surveying.

Other advantages will be gained by employing natives in surveying and levelling. Their better powers of communicating with the people will enable them to get fuller information regarding the nature of the country, the position of materials, and other important matters, and their work need not be confined to the cooler hours of the day, which is considered necessary with the East Indians employed at present. As the Surveyors will always be acting under the immediate instructions and check of either an Engineer Officer or a Sub-Engineer, their duties will be almost wholly mechanical, as already said. They will form the lowest grade of the Engineer Department, and in general will be very young men. Their course of education will be confined chiefly to the use of levelling and surveying instruments, plotting surveys and keeping field-books in English; but like all other classes of the subordinate department, they will be taught while at the school to work with their own hands on buildings under execution.

It

It does not seem necessary to say anything as to the classes of the establishment. Of the Superintendents of Maramut and the Foremen we have already spoken; the Accountants will need similar qualifications to the estimate makers. The Gomastahs are the class employed to keep the accounts of the department under the Collectors and Tahsildars, in the native languages; as to this part of the establishment and as to the expediency of retaining the use of the native languages in the accounts of the department, we shall speak in our Second Report. The other classes not noticed, either explain themselves or need no special remark.

The present Survey School.

609. Before going on to set forth our views as to the means to be adopted for training up men for the subordinate grades of the department, it seems proper that we should give some further account of the only school for the purpose in existence now; and explain our reasons for recommending its abolition, and the introduction of an entirely new system of instruction.

The "Survey School" as it is called, is in the office of the Board of Revenue, under the control of the Secretary in the Department of Public Works. The only teacher is an Assistant Surveyor, who has, in addition to the school, some general supervision of the irrigation works in the Madras collectorate and of the Cochrane Canal, beside the care of the instruments in the Board's office, with all correspondence regarding them; and in short affords general assistance to the overworked establishment of the Public Works Department. The pupils are admitted on passing an easy examination in "Reading and Writing from dictation, Arithmetic, Elementary questions in Algebra and Geometry, and a colloquial knowledge of one of the Native Languages." They receive no pay while at school; their usual stay is two years, though some are considered qualified in less time. They are expected to find their own instruments; but brushes, colours and paper are supplied at the cost of Government. Their course of instruction is stated to comprehend arithmetic, logarithms, the use of instruments, mensuration, architecture, trigonometry, mechanics, algebra, geometry, plan drawing, the plotting of surveys, and estimate making; but it seems inevitable that their acquaintance with these numerous branches of study must be very superficial. During the second year, they are occasionally employed in copying plans for the office; and when their schoolmaster inspects the small works under his supervision, the pupils accompany him. They practise surveying in the neighbourhood, sometimes in company with their teacher and sometimes without him. The pupils are said to be so well-behaved, that no punishment is necessary beyond an additional hour in school, and that is seldom inflicted. There have usually been five boys under instruction, there are now seven, of ages varying from 17 to 21 years of age; four of them are of European parents, and three are East Indians. When these seven were admitted there were six more candidates, five of whom could not pass the prescribed examination; and the other was rejected because there was not room for him in that part of the office which is used as the schoolroom.

The teaching which it gives is very defective.

610. The cost of the school is very small: the Schoolmaster's allowance is *Rs.* 70 a month;* the boys find their own instruments, and as they are day scholars, the only other charge incurred is for their colours, paint brushes and paper, which is fully repaid by their work during their second year. The whole expense therefore is *Rs.* 70 a month, or *Rs.* 1,680 in two years; so that each of the seven boys will have cost about *Rs.* 240 when he leaves the school. But though the school is kept up on the cheapest possible system, or rather with the least possible expenditure, the result is not satisfactory even as to cost; for there is no doubt, that one Schoolmaster with no other employment, might give instruction to ten times the number.

The defects of the school are easily stated. The schoolroom is so mixed up with the office of the Revenue Board, that it is a scene of confusion; and the schoolmaster has many other things to attend to; and the result is a desultory mode of study, the effects of which may be traced in the after-life of the Surveyors. The course of study fits the pupils for no one branch of their various duties; for though

* There is some confusion about the Schoolmaster's pay. There are two Revenue Surveyors employed in the Board's Office, one as Manager, the other virtually as Assistant Manager. The former of these receives the Schoolmaster's allowance, to make up his pay to what is considered proper for him; the other has charge of the school. The pay of this latter is *Rs.* 176. 4.; but as so much of his time is otherwise taken up, it may still be truly said that the school costs only *Rs.* 70 a month.

though architecture and mechanics appear in the list of studies, nothing appreciable of either is possessed by those who join the Civil Engineer's Department. Hydraulics, or the peculiar management of our works of irrigation, or the means of determining the simplest questions as to the pressures or velocities of water under varying circumstances, are perfectly unknown to them, as are also the modes of determining the strength or necessary dimensions of materials. It is not required of them that they should be able to read any native language, and even in the use of instruments for surveying and levelling, that perfect accuracy which ought to be insisted on in beginners is not attended to. The pupil's habits are unbusiness-like, their work incorrect, and by the accounts given of them, with few exceptions, by the Civil Engineers, their inefficiency on joining their division is only equalled by their vanity.

And it is utterly unable to supply the numbers required.

611. Thus the system of the school, so to call it, is defective and vicious; and all that can be said of it is that it is much better than none at all. Though its practical results have been so slender, in the efficient qualifications of those whom it has educated, yet few as the Revenue Surveyors have been, and defective as have been their merits, so helpless and unprovided is the department, that it would certainly have been much worse off without them.

But a further evil in the school is the scantiness of the numbers that it can educate in any way. It cannot contain more than seven pupils; and that number in two years is altogether inadequate to the requirements of the department even in this single grade. And the notorious consequence is, that in repeated instances very undeserving men have been retained in the service as Surveyors, simply because if they had been dismissed as they deserved, none could be got to supply their place. And as regards any other class, this school can give no assistance whatever. But it is now necessary to provide for the education of the European subordinates of the department; and it is necessary also, as it has ever been though hitherto wholly neglected, to give instruction and training to the numerous class of Maistries or Foremen. Neither of these can be attempted by the present school. We are decidedly of opinion that it ought to be abolished; and that a new institution, based on more correct principles, and more commensurate in its extent with the requirements of the department and of the country, should be established without delay.

Special education and training must be provided for the department.

612. We proceed then to set forth the means which appear to us to be the best for securing the qualifications required in the various classes of subordinates of the Public Works Department. Very early in our inquiries we were brought to the conclusion that these could only be obtained by means to be specially provided by Government itself. Education, and more emphatically this species of education, is not at such a point in this country, that the Government need merely to fix a standard of qualification, and invite candidates to compete for admission into the service; it must itself provide all the training machinery. Nor is there any thing unusual or startling in the demand; the same thing is done already for the higher grades of the department, who have very much more command of the means of educating themselves independently than the lower; and in the Medical College at Madras, we have before our very eyes an example exactly in point, of an institution for training the subordinate grades.

It would be waste of time to recount all the various plans which occurred to us while debating the best mode of effecting the end in view. We will simply state that while the subject was before us, we had an opportunity of consulting the reports of the Civil Engineering College at Roorkee in North India; and we found there a system not indeed exactly adapted to our wants, but so nearly suitable, so appropriate in all its main features, that we had no difficulty in determining that we might well adopt it as a commencement, with a few minor changes, leaving it to time and experience to suggest further amendments.

The Roorkee College of Civil Engineering.

613. The origin and growth of the Roorkee College are delineated in the annual reports, and it may be useful here briefly to review them. In the North West Provinces, as under this Presidency, large sums are annually spent on public works, and increasingly of late years; and the want here felt, viz., that of an effective and well-trained subordinate agency, and which the working departments have here tried in vain for many years to force on the attention of the Government, was experienced in North India also, and the present Lieutenant-governor actively took up the subject. The first rudiments of the existing college are found in a

letter

letter from the Secretary to the Lieutenant-governor, North-West Provinces, to the Military Board at Calcutta, dated Umballah, 17 January 1845, which declares the anxiety long entertained by his Honour, "to raise up a body of Native Civil Engineers," to aid the "officers in charge of canals in the operations of surveying and levelling, and laying out watercourses, as well as in the preparation of maps and plans and the formation of estimates." The first idea brought forward in this letter was to take two well-instructed mathematical pupils from the Government Colleges, and associate them with a number of unlettered but intelligent Lallahs (or Maistries as we might call them), under the control of an Engineer Officer, with the view that each of the two classes should impart to the other that sort of knowledge which it possessed, and of which that other was destitute. But even in that first letter, Mr. Thomason's views reached further, and he even then contemplated the training up of a subordinate engineering establishment, consisting of two parts; one, men having received a liberal and scientific education, to be called Assistant or Sub-assistant Surveyors, and to receive handsome salaries; the other, men of inferior education and acquirements, and to be paid on a much lower scale.

Its early beginnings.

614. In pursuance of the first part of the plan, two young men from the Agra and Delhi Colleges were placed under the Superintendent of the Dooab Canal, each on a monthly salary of *Rs.* 50. But there that part of the scheme appears to have been dropped; for the Governor-general having in the following year (9 October 1845) authorized the institution of a class of officers to be called "Sub-assistant Executive Engineers," on a salary of *Rs.* 100 a month, besides travelling allowances, both youths passed the examination and were admitted into that grade, one immediately, the other after a further period of study, and no more appointments of the former kind were made.

On its first institution the class of Sub-assistant Executive Engineer was restricted in number to four; but in the following year the limit was enlarged to 20. During the year 1846--47 eight candidates presented themselves for examination; of whom four passed as qualified theoretically, and were allowed to prosecute their further studies at Roorkee, under the director of the Ganges Canal, with the prospect of being passed, if they qualified themselves in the practical parts of their duty in six months.

In October 1847 the college at Roorkee was founded; the site having been selected in consequence of the extensive works then in progress there in connexion with the Ganges Canal. The institution of the college was proposed to the Government of India by the Lieutenant-governor of Agra, in a letter dated 23 September 1847; and it was immediately approved and agreed to by the Governor-general. An officer of Engineers was at once appointed Principal of the embryo college, and immediate measures were taken for the erection of suitable buildings. The first students joined the college on the 1st January 1848.

The constitution of the college and the subjects of study.

The 1st department.

615. The college is formed into three departments; the first department is intended for candidates for the appointment of Sub-assistant Executive Engineers, who are all native youths from the various Government colleges. The preliminary qualifications necessary for passing into this class are high, comprising a familiar acquaintance with the English language, and a knowledge of geometry, algebra, mensuration, plane and spherical trigonometry, conic sections and mechanics. In this class eight stipendiary students are allowed, with salaries of *Rs.* 40 monthly.

The number of admissions to this class has been small; up to the end of the year 1849-50 (the last year for which we have the reports), the number of applications had been only 10, and the number admitted no more than four.

The subjects of study in this department are stated as follows in the report for 1849-50:

I. Revisal of certain branches of Mathematics.
II. *Materials*—Strength of Materials, Stability of Structures.
III. *Construction*—Masonry, Carpentry, Bridges, Foundations, Earthwork, Roads.
IV. *Practical Hydraulics*—Rivers, Drainage and Irrigation Canals.
V. *Motive Powers*—Machinery and Tools; Hydraulic Machines.
VI. *Geodesy*—Surveying and Levelling; Practical Astronomy; Trigonometrical Surveying.
VII. *Outline of Geology*—Physical Geography; Meteorology.

Together with the following, as appears from the Report of the preceding year; viz., Measurements and preparation of Estimates, and the method of keeping accounts and preparing abstracts.

The 2d department.

616. The second department of the college is for the training of European Overseers, the pupils being non-commissioned officers and soldiers. These men also are subjected, before admission, to an examination in reading, writing, arithmetic, elementary geometry, mensuration and simple plan drawing; a certificate of character from their commanding officer is also required. Their travelling charges to the college are paid; and while there they receive the same allowances as if with their own regiments. The time allowed for instruction at the college was at first limited to six months, but it has since been found necessary to extend the term. If ultimately approved, the men commence to receive the pay of an Assistant Overseer, and are either at once draughted off for the public service, or remain some time longer under instruction. The number allowed in this department was at first 10, it is now 15; it appears to be always complete. The studies of this department also are described in the Report for 1849–50; they are, plane geometry, mensuration, algebra and its application to geometry, plane trigonometry, the measurement of heights and distances, and the elements of mechanics. Their reading on practical subjects, it is added, may be detailed under the same heads as those of the first department; the subjects being taken up more briefly and treated more simply, to suit the more limited time and attainments of the students.

The students of both the first and second departments "are required to pay frequent visits to the works in progress in the vicinity, to make sketches and record their observations; and as a special exercise, to furnish written descriptions of particular works and processes." They are also instructed and constantly practised in surveying and levelling; and they are also instructed in architectural and topographical drawing, &c.—Report for 1848-49.

The 3d department.

617. The third department is for the instruction of native youths in surveying, levelling and plan drawing. The requisites for admission are a fair acquaintance with arithmetic, as far as the rule of proportion, and with vulgar and decimal fractions, and an ability to read and write Oordoo in the Persian character. Sixteen stipendiary students receiving each *Rs.* 5 monthly are allowed in this department. The instruction is communicated in the Oordoo language, and it comprises the following branches: Practical geometry, with its application in the field to surveying purposes, measurement with the chain and calculation of areas, surveying with the prismatic compass, protraction by bearings, theodolite surveying, protraction by traverses, and calculation of areas by the universal theorem; preparation of village field maps, and detailed area measurements as in the revenue surveys; levelling and construction of sections. They are also instructed in topographical drawing, and in copying, reducing and finishing maps and plans. (Report for 1849-50.) In short they are instructed in all that is calculated to make them skilful Surveyors, but in nothing else.

An institution of a similar kind is necessary here.

618. Having thus sketched the origin and growth of the Roorkee College as far as we have the means, and detailed its arrangement and course of instruction, we will now, having the advantage of the experience of that institution, set forth the plan which appears to us the best to meet the requirements of the public service at this Presidency. We will not stop to prove the necessity of such an institution here, for we are persuaded that no well-informed person, conversant with the nature of the case, will hesitate to admit it. Of the three great professional departments under the Government, the Medical service, the Engineers and the Artillery, due pains are taken in all, that the commissioned grades shall be properly instructed in England; as to the subordinate grades, the medical service is provided with an efficient school of instruction, which well vindicates in its results the attention and expense bestowed on its gradual improvement; the Artillery also, in the laboratory and workshop, possesses the means of giving valuable practical instruction to the men of the corps in their duties: in the Engineering Department alone the means of such instruction are almost wholly wanting. And yet the interests of Government are not a little involved in the skill and intelligence of this last department. It is invidious to make comparisons; every one of the three departments has its own peculiar value and claims to attention; but in a pecuniary point of view the injury sustained by Government during the last 40 years, from the ignorance and inefficiency of the subordinates of the Engineering Department, may fairly be pronounced

nounced incalculable. The college of Roorkee, however, at once saves the necessity of further remarks; the want was felt there, and it has been supplied: it is even greater here, and it must be supplied here too.

619. The following are the principal points on which some variation from the Roorkee system will be needed here. The first is, that we do not here require a class of natives corresponding to the first department of the Roorkee College. In the first place, there are no institutions under this Presidency capable of producing young men with qualifications nearly approaching to those required for admission to that department. The highest education given in any institution at this Presidency is at the Madras High School, and even there the scale does not rise so high; we may add that even in North India, with the numerous Government colleges, the number of qualified candidates is extremely small. Up to the close of the year 1849–50, a period of two years and-a-half, only 10 candidates had offered themselves, and no more than four had passed the test.

Some variations from the Roorkee system will be needed.
First; a native "first department" would be out of place.

But, second, we have already stated our reasons for holding that for the present, at least, it is necessary that Europeans should constitute almost the whole of that grade which is to stand at the head of the subordinate department, with respect both to salary, influence and scientific attainments. This opinion is founded not merely on the fact just adverted to, that natives possessing the required attainments could not be met with, but upon the still more important consideration, that activity, energy, promptitude of resource, self-reliance in difficulty, and most of all probity, qualities fully as necessary to an effective discharge of duty, can be found most cheaply and most surely in Europeans, if not in them only. And on this point we may here observe, we find our opinion corroborated in part by Lieutenant Maclagan, the Principal of Roorkee College. In his Report for 1849–50, speaking of the first department, he says, "Personal energy, self-confidence, independence and decision, are of much importance to practical men in the department of engineering, qualifications which there are few opportunities of testing at this college. Their absence may be suspected. There is at all events observable the nearly allied disposition to receive confidently all that is read, without sufficiently examining its truth, and to be easily satisfied with any amount of information given, while resting contentedly ignorant of what is not specially taught."

We are convinced that so far as the exigencies of the public service are concerned, these will best be satisfied by confining the highest grade almost wholly to Europeans. If there is another end in view, viz., to encourage native youths to acquire knowledge, by holding out these good appointments as prizes, we will only say that, however good the object, it is an educational one, and the cost ought to be charged to the educational fund, and not to the Public Works Department. But we venture to advance the opinion that our scheme of admitting to the class a few really distinguished natives, distinguished not merely by academic honours, but by the actual display of energy, practical intelligence, and probity, and the placing them on equal terms with Europeans, and under the influence of their example, will be found not less calculated to develop in the native character all the higher moral qualities.

620. The second principal variation required here from the Roorkee system, is that the class of Sub-Engineers will need a higher standard of instruction than that provided there for the Europeans, who are to be only Overseers. The Sub-Engineers, as their name imports, and as we have already explained, are to be a subordinate class of Civil Engineers, using the term in its broad and not its mere local and official sense. They will therefore require instruction in all branches of Civil Engineering, and the candidates for this grade, who as already said will be almost exclusively Europeans, should in our institution, take the place of what is called in the Roorkee College the first department.

Second; our "first department" should consist of candidates for Sub-Engineerships.

Our Overseers will require the same qualifications as those of Upper India, and they will properly occupy the class of studies prescribed for the second department at Roorkee.

As to the third department, some change will be necessary in the course of instruction, to adapt it to the training of our foremen. The students in that department are trained up, as we have already observed, solely with a view to their becoming expert Surveyors; and we gather from the reports, that in point of fact their future employment is likely to be chiefly in that line. Under this Presidency the case is different, the duties devolving on a Maistry or Foreman, as we have described them (paras. 76 and 77), demand an acquaintance with surveying,

Third; the studies of the 3d department will need some modification.

levelling, plan drawing, &c., but they require something more besides. A Foreman must be in his degree an Engineer; he will have to manage works, to design and estimate their repair, and to execute work. He will therefore require instruction, and especially practical instruction, in the use of tools, the strength of materials, in the various species of construction, and in the incidents and treatment of hydraulic works. The course of instruction prescribed to the third department at Roorkee will very well suit our class of Surveyors; but the Foreman will require all the foregoing in addition. The studies of the Foreman should embrace the same subjects as those of the Overseer; but a lower standard of attainment will be fixed as the minimum. The instruction may also be given in a more popular form. It will properly be one of the early duties of the Principal of the college to compile or procure to be compiled a class-book or books of instruction with special reference to the hydraulic works of this country. No such work exists at present, or any means of acquiring information of that kind, other than the tedious one of the personal observation and experience of each individual officer.*

Besides these classes, we have already stated our opinion that the Accountants and Estimate-makers of the Public Works Department ought to receive some regular instruction in their duties. For the latter it is obviously necessary; and the very defective and irregular system now prevailing in the accounts of the department show that the Accountants require it likewise; and lastly, the Draughtsmen of the department, who under the new system are to be confined to the mere duty of fair copying plans, will also need to be instructed in the art.

Proposed classification of the students at the College.

621. The following then will be the divisions of the college best suited to our requirements, and we will adopt the term "Department" used at Roorkee.

First department for candidates for the rank of Sub-Engineer, being almost wholly Europeans who have passed through the grade of Overseer. The instruction to be very similar to that of the first department at Roorkee; having the same object, viz., to make Engineers.

Second department for training men for the rank of Sub-Overseer. The course of study to be very similar to that of the second department at Roorkee, which has the same object.

Third department for the training of Foremen and Surveyors; perhaps it may be expedient to have two divisions in this department, one for Foremen, and the other for Sub-Foremen and Surveyors. The latter division will also comprise the students for the grades of Accountant, Estimate-maker and Draughtsman.

Terms of admission and studies for the 2d department;

622. We must add a few remarks to explain our views as to the general arrangements of the college. We will begin with the European classes; that is, the first and second department; and for convenience we will take the latter first.

The members of the second department should be admitted on the same terms as at Roorkee, to be received from any European corps serving under this Presidency, whether Queen's or Company's, if the necessary arrangements can be made with the authorities of the former service, or specially enlisted in England in the mode suggested in an earlier part of this section, or similarly enlisted in this country, if fit candidates should present themselves. The preliminary examination to be held as far as practicable at the station where the applicant may happen to be. The course of instruction may be the same as that of the second department at Roorkee, with the addition of accounts and estimate-making; its duration should be in general at least one year, but longer time to be allowed when it may appear expedient. As at Roorkee, the travelling charges of the men to the college should be paid; and they should receive while there the same pay and allowances as with a regiment.

In the grades of Overseer and Sub-Overseer there are four classes. The general rule for promotion from one to another should be by seniority; but before promotion from the grade of Sub-Overseer to that of Overseer, a man should be required to show by examination that he had not forgotten, at least, what he had once known. Certificate of good conduct should also be required on every occasion of promotion.

623. Candidates

* Just as we are closing this Report a comprehensive and useful manual by Lieutenant Foord of the Engineers has issued from the press, which ought to be mentioned as forming an exception to the concluding statement in the text.

623. Candidates for the rank of Sub-Engineer should be receivable from any of the four classes of Overseers, with certain limitations as to a minimum length of service; and a limited number from among the Superintendents at Maramut. Being admitted they will constitute the first department of the college. The terms of admission should be to pass a preliminary examination, the subjects for which might be adopted at first from those laid down for the first department at Roorkee. Testimonials of character should also be required from both classes of candidates. The scale of subsistence money allowed for this department must be liberal; for candidates from the grade of Overseers it should not be less than *Rs.* 60 a month, which would be very much below what they would have left, in order to enter this department; for Sub-Overseers, *Rs.* 40 a month may suffice. The course of instruction should extend to a full year, or longer if necessary. We shall presently state the numbers required in every one of the departments, in order to supply the demands of the service.

Terms of admission and subsistence for the first department.

624. We must here observe that we consider a period of service as Overseer very necessary to Sub-Engineers, excepting those who have served as Maramut Superintendents, for the sake of the valuable practical experience so obtained; but we consider it equally important that the selection for the Sub-Engineer grade shall be not at all by seniority, but entirely on personal qualifications displayed, after a certain fixed period of service, in the Overseer grade. A large proportion of the latter class will be men very useful and valuable in that sphere of duty, as energetic, laborious and trustworthy Overseers; but who from the want of early mental discipline or of natural aptitude, could never become intelligent Engineers. For all that class the gradations of rank and pay in the grade of Overseers provide sufficiently well. They will usually be men who, if they had not entered the Public Works Department, would have been raised by steady conduct to the grade of Staff Serjeant; and the scale of allowance to Overseers holds out to them better prospects of advancement than they would otherwise have enjoyed, in return for the more arduous, irksome and responsible duties to which they are so called. The additional rank of Sub-Engineer is therefore not required as an object of ambition to this class; it is a different grade, with different duties; and those duties are important, and the best men obtainable must be got for their performance. There are not a few young men of respectable birth and education and good principle, to whom, in the absence of a better provision, a Sub-Engineer's appointment would be an object of ambition, and who from family connexion with India or other causes would be favourably disposed to the service. Such young men, after a short course of instruction at the college, and after a few years of practical work and discipline in the grade of Overseer, will be valuable additions to the department. And we believe that with the prospect open of promotion by good conduct to the rank of Sub-Engineer, the entering in that of Overseer will not be regarded as irksome or degrading.

The selection of the Sub-Engineers must be by merit and not by seniority.

625. We propose that the third department shall consist of two divisions. The second or lower division will be formed of native youths under instruction not only for the grades of Sub-Foreman and Surveyors, but also for Accountants and Estimate-makers, and for Draughtsmen; students will be admitted after passing an entrance examination, similar to that prescribed for the third department at Roorkee. The test will consist of a good knowledge either of Tamil or Teloogoo (or for a certain limited proportion, Canarese or Malayalum), to read and write; a fair knowledge of English, speaking, reading and writing; and a fair acquaintance with common arithmetic, the rules of proportion, and vulgar and decimal fractions. It appears to us desirable that all these classes should begin their studies together, and that all should learn something of every subject taught; the Foreman and Surveyors will need some knowledge of accounts and of plan drawing; and some knowledge of the practical work of the department will be useful to the Estimate-makers and the Draughtsmen. But all classes will not need an equal degree of proficiency in each branch of study; and after a short term, the several classes may be separated.

The 3d department; the lower division of it.

We have already said that some knowledge necessary to the Sub-Foreman will not be required in the class of Surveyors, and we may add that the class which we term Surveyors are intended to be only assistants working under the immediate eye of a superior, and therefore will not by any means require the degree of proficiency contemplated at Roorkee for the third department there; they will in fact need little more than to be able to perform mere mechanical operations with rapidity and exactness. After a time those who evince the greatest dexterity in the use of surveying instruments and in the other operations of surveying, including

the ability to plot a survey accurately, though without any pretence to neatness or finish, should be draughted off, with their own full concurrence, to enter on the duties of Surveyor. This division may perhaps take place at the end of six months, or a year, or it may be permitted at any time during the course of a half-year. So also those for the grades of Accountants, Estimate-makers and Draughtsmen, will be told off in due time. The remaining part of the class will continue their studies; and after completing their course and passing the prescribed examination, will be declared fit for the post of Sub-Foreman.

The upper division.

626. We further propose, that both Sub-Foremen and Surveyors (and the other classes also, when they shall desire it, and display the necessary aptitude), after a certain time passed in those grades respectively, for which a minimum may be fixed by rule, shall be permitted, on obtaining a certificate of good conduct from their superior officer, to re-enter the third department of the college in the upper division, as candidates for the grade of Foremen. We suppose, that generally a year will suffice to qualify as Sub-Foremen, and a year more as Foremen; and that a second course of a year or a year and a half, will enable a Surveyor also to pass the examination as a Foreman.

The subsistence money to students in this department need not be much; *Rs.* 5 monthly will probably be found sufficient in the second division, and *Rs.* 10 in the first, the members of which will have abandoned better salaries in order to come there. In case of students coming from a distance it will be expedient to make an allowance for travelling expenses; for it is undesirable that the students should be drawn exclusively from any one particular locality, and without such a provision, the selection would be in a great degree limited to the near neighbourhood of the college.

We may here observe, that it is by no means our intention that a course of instruction at the college should be made an essential condition in the case of Writers, Accountants and Estimate-makers, or even Draughtsmen. For some grades of servants the necessary qualifications will be obtainable nowhere except at the college; and even with these classes the instruction to be got there will be so valuable as a means of obtaining advancement, that we believe it will be much resorted to by such. But as the qualifications needed in these latter classes are less special and peculiar than in the others, we think it will be sufficient that they shall obtain a certificate of qualification for their respective duties, from the Engineer authorities of their own division.

The English language should be the only medium of instruction.

627. We consider it of great importance that the public works should be made an English Department: that the accounts should generally, at least, be kept in English, and should be in the simple English form, instead of the complicated native system now in use,* and that correspondence and reports should be in great part in English also. And with this view, we are of opinion that the English language should be the sole medium used at the college for conveying instruction. Nor would this be by any means a novelty; for all those native Maistries and Superintendents of Marimut who have hitherto acquired any European knowledge in connexion with their duties, have obtained it from their European superiors of the Civil Engineer or Road Department, or at least in frequent communication with them; thus that knowledge is associated in their minds, and in the native mind generally, with the English language. And we believe it will be found that a sufficient number of candidates will be found possessing the necessary stock of acquaintance with English; rather, we should say we believe that at present, at least, all the candidates coming forward to enter this line, whether a knowledge of English is made a condition or not, will be young men already taught in English.

We consider it important, with reference to their after duties in the service, that the students should be familiarized with English; and we think it not less essential for another cause, viz., that without that the native student will not be able fully to benefit by the instruction obtainable at the college. That instruction should go at once from the European teacher to the mind of the pupil; but the former will not be competent to teach or lecture in Tamil or Teloogoo; he will be selected as a proficient in some one or more of the studies of the institution, not as a linguist, and the students must be capable of understanding him in his own tongue.

Some general suggestions.

628. It should be a standing rule that Overseers as well as Maramut Superintendents pursuing their studies at the college for admission to the grade of Sub-Engineers,

* We shall speak more in detail on this point in our Second Report.

Engineers, should be considered supernumerary and non-effective in the grade to which they belong, and that their places should be supplied by promotions to complete the establishment. And the same should be the rule in the case of Sub-Foremen and Surveyors studying for promotion to Foreman.

In speaking of the tests proper for the examination, it must not be forgotten, that as regards both those before admission into the college, and those before passing out of it into the public service, it will be necessary and expedient to lower the standards at first, and raise them gradually. If too high a standard for admission is rigidly insisted on at first, the college will be without pupils, and unless the conditions of getting through are somewhat lower at first than they may properly be made after a few years, the public service will be without members; and for some time the whole object of the institution will be sacrificed. As the value of the opportunities to which the studies at the college open a way becomes better known, there will be no difficulty in raising the standard of acquirement in all the grades.

We would recommend half-yearly examinations, at which the progress of all students would be ascertained and prizes awarded to the most deserving; and at which those passing the required examination should be declared competent to be appointed to the grades for which they have been training.

It will be necessary to provide the means of giving the European portions of the students some acquaintance with a native language. A critical knowledge will not be at all required; but some ability to read it, a grammatical knowledge of its structure, and a familiar use of it colloquially, will be essential to enable either the Sub-Engineer or the Overseer to perform his duty. We have already said that Tamil and Teloogoo are the two languages most generally useful; Canarese and Malayalum should also be studied by a limited number.

The necessity that the college should give real practical skill as well as theoretical knowledge.

629. But the handicraft arts connected with construction being at so very low a point in this country, it is of the very greatest importance that the men produced for the department by the Engineering College, should have real practical skill, and not merely theoretical knowledge; and without the means of imparting such practical skill, that institution would fail of half its proper effect. This state of things could hardly be realized probably in England, where the skill in question is to be had in abundance in the labour market. But in this country the great want experienced by officers engaged in the execution of a work of magnitude, is of that class of men who in England might be called "Foremen;" men who have been bred to particular handicraft trades, and have worked with their own hands, but who having more intelligence and education than their fellows, have come to be placed over a party of workmen or a portion of a work. It is most essential, therefore, that this practical handicraft skill should be communicated to the pupils of the school, and yet it is not easy to determine precisely the best way of effecting it. We will make a few suggestions, but our object is less to speak of the means of effecting the object, which do not fall within our province, than to insist on the essential importance of the thing itself. One main defect in the existing Revenue Surveyors is the want of this practical skill; and we are most anxious that it should be guarded against for the future.

Some suggestions as to the means of communicating it.

630. The following are the means which occur to us for carrying out the idea:

1st. The pupils should take an active part in the erection of all the buildings for the accommodation of the school. In the earlier buildings the ordinary classes of workmen might be employed also, to prevent delay; but afterwards, when the more necessary buildings had been completed, the whole construction of the remainder might be effected by the very hands of the students.

2d. It seems desirable that the mechanical arts and operations connected with building, such as brickmaking, the mixing of mortar, and carpenters' and smith's work, should be constantly carried on upon the school premises. The materials prepared might be turned to good account, especially if the school is established at the Presidency.

3d. The pupils should be much upon Government works going on in the neighbourhood, of all the various kinds, as far as possible; including not merely bridges and buildings, but irrigating tanks and channels, and the several species of works belonging to them. Parties of the students might sometimes be vested with the actual execution of certain works with their own hands, under the direction of the Local Engineer. Here again the Presidency would hold out great advantages from the number and variety of public works always in progress, compared with other localities.

4th. Besides

4th. Besides what is learnt in this way actually at the college, it may be expedient that when pupils pass out of the institution they shall go for a limited term to complete their course by working with their own hands on some great work in execution; or in some cases pupils might be sent out during their connexion with the college, to be employed in this way on some work in progress, and then return to complete their course; or, again, the officer in executive charge of such a work, might be empowered to take a limited number of apprentices, or pupils, to labour in actual handicraft employments in the various departments of the work, and afterwards to enter the Engineering College, and go through the regular course. Employment of this kind would be especially valuable on those works where there might be, as there is at the Godavery anicut, an English workshop for making and repairing machinery, &c.

We must repeat that we only offer the foregoing as suggestions; those to whom it may be entrusted to carry out our general propositions, and especially those concerned in the management of the college, will be in a better position to determine the precise measures. We are only anxious to point out strongly the necessity of this branch of instruction. The school teaching is absolutely essential to the efficiency of the department, but practical teaching is so also, and must by no means be overlooked.

General management of the college.

631. In concluding our notice of the general structure and arrangement of the projected college, we have but a few more particulars to notice. We propose, that like the institution at Roorkee it shall be under the management of a Principal, to be a Commissioned Officer of Engineers, and who shall have the assistance of a Head Master and other Masters; and with other aid to which we shall advert presently. We further propose that the Chief Engineer shall be visitor, with the duty of bringing to the notice of Government all measures likely to increase the efficiency and usefulness of the institution.

A library and model room to be formed.

One important object should be to form a good professional and general library at the college, for the use of the students; and after leaving that institution and entering the public service, every practicable facility should be afforded them of obtaining books, and so keeping up their knowledge. One great advantage of enabling the men thus to pursue their studies by themselves and improve their talents, will be that of shortening the time that they will need to be kept from active employment at the college to qualify for an examination for promotion; a still greater advantage will be that a habit of reading, and the possession in that habit of a source of rational amusement, is the best preservative against those pernicious habits into which a European is liable to fall in this country when cut off, as many of the Public Works Department must often be, from social companionship. This important object of supplying the men (and natives as well as Europeans) with books, might be effected, partly by a system of circulation under certain (but liberal) rules as to the care of books, and partly by selling books on cheap terms to those desirous of possessing them.

Another important point in the general arrangement is liberality in the supply of instruments; there should always be a large stock on hand; and both the students at the college and the members of the service should be encouraged to make free use of them. The rules respecting them should not be so rigid as to deter from their use, for there is no doubt that in the end the great loser by such restriction is the Government itself.

Another important object will be to form a good model room, containing models of machinery, of celebrated structures, of all kinds, in all parts of the world, and of all the forms of the various parts of the structures incident to irrigation works in this and other countries. A collection of good models will be a most valuable aid in communicating knowledge; of course it must be very imperfect at first, but every opportunity should be taken to improve it.

The Presidency will be the best position for the school.

632. It is a point of no little moment to determine the best locality for the college. We have no station such as Roorkee, where extensive works are likely to be always in course of execution for many years to come; even the works in connexion with the anicuts of the Godavery and the Kistnah will be completed in a few years, and the remote position of both works would be a serious objection to either as the site of the school. After careful consideration, we have come to the conclusion that the college cannot be placed anywhere so well as at the Presidency. There are some objections to it, indeed, the chief of which is that in so large a place it may be difficult to exercise due control over the conduct of the pupils.

pupils. But this is modified by the consideration that not a few of the number will be not youths, but grown-up men, and men of steady character. And further, we would not have the institution in or very near Black Town, or other of the large aggregations of population within the Madras limits, but still within the Presidency district. Another objection is the danger that too many of the students should be youths belonging to the Presidency, a class who will not be the best, perhaps, for the real work of the department; but this tendency may easily be guarded against, and the allowance of subsistence and travelling money to the students, will alone do much to remove obstacles in the way of youths coming from the interior.

Great number and variety of Government works always going on at Madras, a means of practical teaching.

633. On the other hand, there are advantages at the Presidency not to be met with elsewhere. The first which we will mention is found in the great number and variety of public works always in course of execution at Madras. The annual expenditure under the Military Board, in the Presidency division, is about *Rs.* 1,40,000, about half of which is on new works and half on repairs; besides which, there will be work to the tanks of the Madras Collectorate; and the repairs of the Cochrane Canal, recently ordered to be extended and improved, and always hereafter, it is to be hoped, to be kept in good order. Then, again, the project lately brought forward of forming a reservoir above St. Thomas' Mount, and bringing the water to cleanse Madras, with a navigable canal and locks in connexion with it, will supply a great variety of interesting works for the practical instruction of the students; and lastly, another class of works will be supplied whenever the improvement of the port of Madras is undertaken, whether by means of a pier or of a breakwater or both. We do not here mention the works connected with the railway, because it seems likely that they will not be undertaken on the part of Government; but even without them, it is at once seen that the Presidency offers advantages in the way of real practical and experimental instruction, with which no station in the interior can compete.

The services of lecturers may be obtained at Madr to aid in giving instruction.

634. There is a second consideration not less important. In an educational institution embracing so many branches of study, it would not be well that the burden of instruction fell on any one man, however able. Left to the Principal only, with the sole aid of masters who must be men of inferior attainments, it is much to be feared that the college would disappoint expectation. But at the Presidency there would be means of supplying this want. Here there are always a number of scientifically educated men, Engineer Officers and others, capable of guiding the studies of the classes at the college in many of the branches of instruction; and as they all have substantive appointments, a small remuneration would be sufficient to secure their services in this way. And we think it would be much for the advantage of the school that men of that stamp should be engaged in delivering lectures there, in a mode similar to that already established at the Medical College.

The foregoing are the principal considerations which lead us to regard the Presidency as the best locality for the college. And to these we may add that Madras is a very central point as regards the Northern and Southern Provinces, and also that it is situated where the Tamil and Teloogoo languages meet. And independently of the more direct advantages of this plan, we cannot but think that no little would be gained indirectly, from having the institution and the students within the influence of a large and active place, rather than in a remote and solitary station, with little intercourse with any classes out of their own immediate circle.

Number of stud necessary in ea of the departme

635. We will now close this sketch of the proposed college with a statement of the number of students required to be permanently under tuition, in order to keep up our proposed establishments, and a computation of the yearly cost of the institution.

The general rate of casualties of all kinds among Europeans serving in this country is reckoned at one-tenth annually. "An account of Roorkee, with a scheme for its enlargement," printed last year by the Government of the North-Western Provinces, states the casualties among the Overseers up to that time to be at the rate of 11 per cent. a year, but anticipates a slight reduction of this rate as dismissals become less frequent. We take 10 per cent. as the rate for which we must provide; and the total annual number of casualties will therefore be 20. The calculation of the number required to be under instruction in order to meet a given demand, is however complicated by the circumstances that there are to be two grades of appointments, for each of which a separate course of instruction is provided; and that some men who enter the lower grade will not rise to the higher.

We think it may fairly be assumed, however, that of the 20 to be supplied every year, eight will be two years at the college, and 12 one year. This will give 28 as the number needed to be always under tuition.

For the native part of the establishment the average length of service may be taken at 15 years. The annual number of casualties among the Superintendents, Foremen and Surveyors, will thus be 48; but here also the calculation is complicated in a similar way, by the different grades requiring different periods at the college. We may suppose, however, that of the whole number of men to be supplied annually, 28 will be one year at the college, and 20, two years; and thus the numbers in training for these grades should be kept up to 68. The total number of Engineer Writers, Accountants, Estimate-makers, and Draughtsmen, on the establishment will be 369, and the annual casualties among them will be 24; supposing that half the numbers in these grades attend the school for a year, the number required to be always under preparation will be 12.

The foregoing number would provide for the casualties in the service; but it will be necessary to add a few more both to the second department and to the second division of the third department, to meet those cases in which individuals will leave the college from any cause, before completing their course, and so not come on the establishment at all. To meet this want, we would add five to the second department and 12 to the lower division of the third department. The number of students required in the various departments will thus be as follows:—

First Department, 8 students, at 1 year each			8
Second - ditto 25 - ditto - ditto			25
			33
Third Department	First Division, 20, at one year		20
	Second ditto 72 - ditto		72
			92
		TOTAL	125

These we state as the probable numbers; but we cannot pretend to accuracy in such a calculation, and it is very likely that the estimate may be found to need revision.

Probable cost of the institution.

636. The following may be taken as an estimate of the cost of the college: in framing it we have had regard to the actual scale of salaries at Roorkee:—

Tutorage and Establishment.

	Monthly.
Staff salary of the Principal	*Rs.* 700
Salaries of Lecturers or Professors	600
Ditto of the Head Master	350
Ditto Two Masters	500
Ditto Two Moonshees as teachers of the native languages	150
Establishment, about	400
TOTAL	2,700

Subsistence of Scholars.

First Department 8, at 50 rupees (average)		400
Second ditto - 25*		,,
Third - ditto - 20, at 10 ditto		200
72, at 5 ditto		360
Grand TOTAL - 125		960
		3,660 a Month.

To

* The students in the Second Department will receive the same allowances as if with their regiments; and thus their attendance at the college will entail no increase of charge. We have, therefore, followed the Roorkee precedent, and omitted the subsistence of that class from our estimate.

To this must be added the annual expenses for the gradual formation of a library and model room; the necessary and contingent expenses of an educational establishment, including the books and instruments used in tuition; and lastly, the cost of the buildings used for the college, which may be computed in the form of a per-centage on the capital outlay, to cover interest and repairs.

637. The whole may probably amount to from *Rs.* 50,000 to *Rs.* 60,000 a year; and in justification of the demand, we confidently believe that we need only point to the circumstances of the case. *Rs.* 60,000 would be only 4 per cent. on the annual cost of the Public Works Establishment, the value and efficiency of which would be enormously increased by this trifling additional expenditure. Beyond doubt the annual saving of direct outlay, through the economical and efficient performance of work, secured by a well trained body of officers, will exceed many fold the cost of the institution: indeed without efficient training the establishment would be only a source of loss and mischief. Again, compared with the expenditure to be directed by the department, the cost of the college assumes a still more insignificant aspect. We may take the whole actual outlay at fully 48 lacs annually (*see* para. 481), including here, in the expenditure to be controlled, that for the improvement of the ports; upon that total amount the annual cost of the college will be only $1\frac{1}{4}$ per cent.

It would be insignificant compared with its value.

We will only add, that we do not offer this outline of a college as a complete or perfect scheme, but only as a rough plan to be improved upon. Every year has suggested, and continues to suggest, amendment at Roorkee; and the Medical College at Madras, though of much longer existence, still continues progressively to receive improvements. In like manner the projected Engineering College can only attain its full measure of usefulness by degrees. It is certain that such an institution is eminently and emphatically necessary; and the first thing to be done is to establish it on a sound basis, and with all the advantages which present knowledge suggests. If this is done, and the college is connected with a suitable agency for bringing further improvements required to the notice of Government, with the force which attaches to the opinions of persons of rank and character, and if the institution be so fortunate as to obtain from the Government the same liberal and enlightened patronage enjoyed by the fellow institution at Roorkee, then it cannot fail to become vastly and progressively beneficial.

This plan of a college is only offered as an outline.

Section XI.

Recapitulation, and Concluding General Remarks.

638. In this concluding Section it is our purpose briefly to recapitulate what we have said in the foregoing parts of this Report; and then to close with a few general observations on each of the principal subjects which have engaged our attention.

The scope of this section.

The first Section simply recites our appointment, and announces the plan of our Report; and agreeably to that plan, the succeeding three Sections are devoted to an endeavour to set forth the present condition of the Department of Public Works, under its three chief divisions of the Maramut Department, the Road Department, and the Engineering Department of the Military Board.

639. In the second Section we sketched out the past history and present condition of the Department of Public Works under the Board of Revenue, but with particular reference to the works of irrigation. We first traced the gradual changes from the time when the first English Collectors, in assuming charge of the provinces transferred to British administration, received at the same time numberless irrigation works on which the revenues of those provinces were very intimately dependent; and showed how, as the value of these works, the necessity of attending to their maintenance, and the ruinous consequences of neglecting them, became gradually impressed upon the ruling powers, the department for the care of these valuable works expanded by little and little; and we described its present extent and distribution. We next described the various classes of works of irrigation, both tanks and channels, and added some information respecting the total number

The second section; sketch of the system of irrigation: Paras. 6 to 16.

of such works, which by the best data obtainable we found to be as many as 43,000, in only 14 out of the 20 districts. The revenue yielded by the whole we found to be about 150 lacs yearly, and their capital cost about 1,500 lacs.

The Public Works Department of the Board of Revenue: Paras. 17 to 25.

640. We next proceeded to speak of the agency by which all these valuable works are taken care of, and first of the Board of Revenue, in its Department of Public Works, the controlling authority. We gave some statistical facts to show the quantity of business in the Board's office; and, after observing that the Board does not seem justly obnoxious to some charges which have been brought against it, we stated our opinion, notwithstanding, that it has failed in the most important part of the duty of a controlling authority; viz., in not exercising a general intelligent control over all parts of the country, the state of its works, and its wants. The cause of this failure we declared to be the physical impossibility of a Board, burdened with heavy duties in connexion with the management and collection of the revenue of a vast country, to give sufficient attention also to the extensive department of Maramut. And, after showing how the labours of the Board in this department had steadily increased for a number of years, and pointing out that it must inevitably increase much more, and ought to do so, we declared our conviction that the Board of Revenue was and must be unequal to the additional task of controlling a department of such magnitude, and that a new and a different authority must be constituted for the purpose.

The agency under the Board: Paras. 26 to 58.

641. We next came to detail the system of carrying on work in the provinces under the Board of Revenue in this department. We explained that at present estimates are for the most part made by the Civil Engineer's Department, but that almost all are executed by the Tahsildars or subordinate Revenue Officers, under the order of the Collectors; and that after execution, as many of the works are inspected by the Civil Engineers and his subordinates as they can find time to visit. And we pointed out that the Commissioned Officers of that department are still very far too few for the due performance of the duties required of them.

We then spoke of the subordinate agents of the Civil Engineer Department; viz., the East Indian Revenue Surveyors, and the new class of European Overseers, and described their qualifications respectively. We quoted the high testimony given by many of the Civil Engineers respecting the conduct and services of the latter, and mentioned, also, the reasons which they have for being dissatisfied with the treatment they have received from the Government. We advocated more liberal treatment of this class, on grounds both of policy and of justice; and stated our opinion that the only remedy for the defects of the class of East Indian Surveyors would be to throw them into competition with men of European birth.

We next came to the actual execution of work: we described the various classes of officers concerned in it, the chief of which are the Tahsildar or head Revenue Officer of a Talook, who makes arrangements and disbursements, and in whose office the accounts are kept; and the Maistry, whose duty it is to show how the work should be done; and we described the method and the routine by which the work is carried on.

Defects and remedies: Paras. 59 to 74.

642. Having finished that review of the structure and working of the department, we proceeded to notice some of the most prominent defects in its operation; viz., great dilatoriness in executing work, and untruthfulness in the accounts rendered of it, and suggested means to remedy both. We also adverted to "data tables," or official lists of prices of labour and materials, which need much revision, and noticed the subject of compulsory labour on public works. We saw reason to believe that compulsion in obtaining labour is practised in most districts; and we stated what appeared to us to be the reason why the authorized rates of payment do not secure voluntary labour, and the remedies proper for the evil; those remedies being, fair measurement of work, full and prompt payment of the rate nominally allowed, and the increased employment of European Overseers, to ensure those measures of justice. We also adverted to the subject of retrenchment of the workpeople by the Civil Engineers in their inspection of work, which is very frequently a source of hardship, and proposed some limitations on this arbitrary checking of charges.

The Maistries: Paras. 75 to 90.

643. We then gave a somewhat detailed notice of the "Maistries" of the department, describing their duties and their defective qualifications, with the reasons

reasons for their general inefficiency. We also stated the means by which this class was to be improved; viz., by providing proper instruction, of which hitherto they have been almost wholly destitute; by placing them in a position more independent and responsible, and less under the authority of the Tahsildars; by increasing their salaries; and, lastly, by augmenting their number. We referred to the system of taking apprentices for instruction as Maistries, introduced by the late Captain Best, when Superintendent of Roads, and of which the results in his own department, under his careful and able superintendence, had been very successful; and recommended that the same plan should be extended, as a temporary measure only, pending the establishment of a larger training institution, such as can alone really satisfy the requirements of the department in this essential particular.

In concluding the section, we recorded our sentiments on certain rules recently propounded by Government for the regulation of the Maramut Department, and objected to by the Board of Revenue, and which had been sent to us for our consideration. We examined the rules (five in number) in detail, and stated our opinion that they were severally impracticable, unnecessary, or pernicious, and that their whole tendency was to stop improvement; and we, therefore, earnestly deprecated their enforcement.

The new rules proposed by Government: Paras. 91 to 106.

644. Before closing this recapitulation of the second section of this report, we beg to call attention to the suggestions which that section contains for changes in parts of the department under the Board of Revenue. The greater part of those suggestions are such as we believe may be carried into effect by the authority of this Government, and they are offered with the view of their being so acted upon immediately. In subsequent parts of the report other and larger reforms are proposed; but their introduction into actual use must be a work of some little time; those to which we are now referring are proposed as intermediate, and are intended to be brought into operation, if it should so please the Government, without any delay. We allude particularly to the suggestions in para. 50, as to the mode of employing European Overseers; to those respecting the accounts of works executed (para. 64); the payment of full and just hire, and paying it promptly (paras. 68 and 69); regarding the retrenchments against the workpeople (para. 73); and in particular to the recommendations as to the temporary means to be taken for the training of Maistries in para. 82, and those for improving their position and responsibility, in paras. 84 and 85.

Suggestions for immediate adoption.

645. The scope of the third Section was to give an outline of the past condition of the roads of the country; it contains, therefore such information on the subject as we could collect, together with a rather full review of the history and the operation of the "Road Department."

The third Section.

We first alluded to the entire absence of anything that could be called made roads when the country first came into our possession, and spoke also of the very rude means of carriage then alone available, and of the very defective attempts at water communication; and we observed that the larger number of carts now in the country, though no doubt due in part to the increased security of property, must still be taken to prove, in some degree, the better condition of the roads; but that very little indeed has been done to aid or improve the water carriage, whether by sea or river.

The early state of the roads: Paras. 107 to 111.

646. We then went on to relate the operations of the British Government on the roads; from which it appeared that for many years they gave them no attention at all; and that when they did, much want of judgment was displayed, combined with very confined views. We noticed the report on the roads by the Board of Revenue in 1813, which represented their condition as bad in the extreme, but stated that the cost of any serious attempt to improve them was too heavy to be incurred; and the reply of the Court of Directors, in 1817, concurring in that view, but ordering that the surplus receipts at the Government ferries should be given up for the improvement of the roads; and we observed that this order has never been acted on down to the present time.

Their treatment by the British Government: Paras. 112 to 120.

We then noticed the operations of the Pioneers in making roads on the great lines, which, from the want of directing skill, and of any care to maintain the roads made, were both very extravagant and entirely barren of permanent results; until, in 1831, we found the Government, vexed at the enormous outlay, and not

seeing the means of obtaining a better return, resolving to abandon all attempt at any general improvement of the roads.

The Salem roads: Para. 121.

647. After noticing the amendment effected in some of the principal roads of the Salem district, by the exertions of Mr. Orr, the Principal Collector, and its good effect, though partially defeated by the absence of any general plan, we came to the report on the internal communications, by Captain A. Cotton, in 1836. In that report, Captain Cotton proposed a general system of communications, to be composed partly of canals, and partly of cattle railroads. The scheme was not taken up, however, by the Government; and a small experimental length of railroad, to bring road metal to Madras, turned out a failure, from various causes. We then adverted to two important lines of road opened some years later; viz., the Sumpajee Ghaut and the Western Trunk Road, evidence of the increasing attention devoted to the subject; and then came to the formation of the Road Department in 1845, designed for the construction and maintenance of the great trunk lines.

The Red Hill railroad: Paras. 122 and 123.

The Road Departments: Paras. 125, &c.

648. The formation of the Road Department and the allotment of four lacs of rupees annually for the roads placed under it, was an additional proof of the more enlightened views now prevailing on the subject of the communications, and of the earnest desire of the Marquis of Tweeddale, then at the head of the Government, to effect something decided for their improvement. But after carefully examining the working of the department, we have been compelled to declare our conviction that the means selected for administering the fund were not judicious, and that the department has been a failure, from defects inherent in its constitution.

The duties required of it.

One Engineer Officer, with two unprofessional Assistants, was placed in immediate charge of 1,300 miles (afterwards enlarged to 2,300 miles), of what was called road, but of which in fact a very small part deserved the name in any sense, and the greater portion was simply lines where roads were to be, and much of it across very difficult country. The whole work of surveying these lines, tracing out the roads, framing estimates, executing the work, keeping the accounts, inspecting the work done, reporting upon it, and sending in the bills for sanction, was laid upon the Superintendent of Roads, aided in the executive duties by his two unprofessional Assistants. The furthest points of the roads under his charge were nearly a thousand miles apart; viz., from the frontier of Cuttack to Ponnany, on the western coast; and this in a country where, from the condition of the roads, travelling with an office cannot exceed 10 miles a day. Yet it was expected that all the multifarious operations above enumerated, all of them essential to the formation of a road, could be carried on over this enormous extent of country, under the Superintendent's own personal direction; and, as if to hamper him in every possible way, the efficient subordinate establishment of Overseers and Maistries which he applied for, was refused him.

Its treatment by the Government: Paras. 136 to 142.

649. The fulfilment of such expectations was an impossibility, even in the hands of a man of such eminent talents, such untiring energy, and such rare physical stamina, as the first Superintendent. The Government soon became discontented with the working of the department, but their dissatisfaction was not directed to the proper points. It seems obvious, that with duties such as we have described them, the Superintendent's only chance of accomplishing his task, was by being continually on the march, yet this constant locomotion was found fault with. Again, the Government saw that little work was done, and that the executive agency was insufficient; but instead of giving more such assistance, they ordered that the Civil Engineers should aid the Road Department, though one reason of the formation of that department was, that those officers had no time to attend to the roads; and at last they reduced the Superintendent himself nearly to the position of an Executive Officer. By this last order the department was changed into a small executive establishment, in charge of 390 miles of road; and of course the salary of the Superintendent is disproportioned to such subordinate duties, having been fixed on a scale deemed adequate to secure talent to control the whole main roads of the country.

Result of our inquiries as to its working: Paras. 143 to 163.

650. After a careful examination of the operations of the department we arrived at the following results:

We found that the work done by the department had been performed with eminent efficiency and economy, under an excellent system established by Captain Best;

Best; but that the amount done was very small compared with what ought to have been accomplished in the time. Out of 24 lacs of rupees, the amount of the grant of four lacs annually for the six years, 1846 to 1851, only 13 lacs had been spent; and even of that small amount, no less than five lacs had been expended under the superintendence of the Civil Engineers, on works projected and planned by themselves and not by the Road Department, leaving only eight lacs, or one-third of the full amount, really spent by that department. And the cause of this short coming was plainly seen to be the utter inadequacy of a department so constituted, and so feeble in numbers to the work required of it.

We found also, that of the great works undertaken, though all of them highly useful, many, especially of the large bridges, were determined on, not because they were the most important, for they were not so by any means, but because they had already been projected and planned by the Civil Engineers, who were also prepared to undertake their execution. So that they thus presented the means of spending money immediately, without waiting for previous examinations, surveys, and estimates; and were also provided with that superintendence which the department itself could not have supplied.

We found that, out of the whole expenditure, nearly eight and a half lacs of rupees was still unadjusted; the cause being that the Superintendent had not been able to find time to go and inspect the work, though some of it had been completed and paid for several years before. Finally, we found that serious errors had been made in selecting the "Trunk Line;" some being included in the list which have not and are never likely to have much traffic, while some lines of first rate commercial importance were omitted. This error seems directly due to the faulty structure of the Road Department. In forming that department, the Government put aside altogether the ordinary intermediate authority, and placed the Superintendent in direct communication with itself. The selection of the roads to be in the first class, required careful consideration as well as local inquiry; the Superintendent, under the heavy pressure of his vast and heterogeneous duties, could find no time for such investigations, and it appears to be foreign to the genius and beyond the reach of the Government, to take them up in the first instance.

651. In closing our remarks on the Road Department, we expressed the decided opinion, that the scheme of having a separate department for the roads is essentially erroneous in this country, because the country being everywhere covered with works of irrigation, which need the constant attention of Engineers, it must be much more economical to make one set of such officers attend to both classes of works. Up to the year 1838, there was one set of officers for buildings in the provinces, and another set for the works of irrigation; and the abolition of that arrangement by doubling the number of Civil Engineers, and giving to each the charge of the buildings as well as of the irrigation works in his division, has been universally allowed to be an improvement. The formation of a Road Department was a revival of the same false principle of distribution; and for this radical and essential fault, independently of the accidental defects of its constitution, we decidedly recommended its abolition as a separate agency.

Its abolition recommended: Paras. 164 to 168.

652. The fourth Section is devoted to that branch of the Public Works Department which is immediately concerned with the military works and buildings; viz., that controlled by the Engineering Department of the Military Board. It contains, first, a sketch of that department, its history and its operations; and, second, a detail of those changes in its structure which appear to us expedient, exclusively of those general reforms in which it will share in common with the other branches of the department.

The fourth Section.

The section opens with an account of the Military Board, which was originally constituted in 1785 as an *ex officio* Board, composed of the heads of various Military Departments. It continued to be so (with some modifications in the composition) till 1839, when it was remodelled, to consist of the Chief Engineer and Commandant of Artillery, with two Stipendiary Members; a change which has conduced to the more rapid and effective dispatch of business. The various duties of the Board, and its mode of transacting business in general were then described, after which we passed on to the "Engineering Department," with which alone we are concerned.

The Military Board: Paras. 169, &c.

Its duties, and the agency at its command, in the Engineering department.

We described the nature and extent of the buildings and works under the Board's control in that department, the territorial divisions into which they are distributed, and the local agency at the command of the Board for the carrying out of their instructions; viz., Superintending Engineers at the Presidency and in the four divisions beyond the frontier, but only casual and uncertain assistance in the five Military Divisions, other than the Presidency Division, within the frontier.

Routine of making estimates, &c. Paras. 176, &c.

653. We then went on to speak of the mode of making estimates and obtaining sanction for work to be done, describing the extent of power reposed in the local Commanding Officers and in the Board respectively, as to authorizing repairs to buildings; as well as the various channels of applying for new works, improvements and alterations, all of which, before estimates can be made, require in this department, the previous approval of Government, to be obtained through the proper office.

And of executing works: Paras. 178 to 189.

We then described the mode of executing works. In the Saugor Division the Superintending Engineer is in the position of direction and supervision as regards three of the four circles or sub-divisions into which it is distributed, and has under him an Executive Officer in each; while in the fourth sub-division he is, incongruously, himself executive also. In all the other divisions where there is a Superintending Engineer he is exclusively an executive officer, with a small establishment, principally of natives, for the immediate superintendence of the work. In the divisions within the frontier, where there are no Superintending Engineers or other officers at the Board's disposal, the work is carried on under great disadvantages. The abolition of the Superintending Engineers within the frontier in 1838, and the increase in the number of Civil Engineers, was on the whole a very great gain. But means ought to have been taken at the same time to provide some regular agency to carry on the works under the Military Board in those divisions, and as this was not done, that work has ever since been performed with much difficulty and irregularity; the executive management being entrusted to officers wholly inexperienced in such duty, and being transferred from one to another, on the relief of corps or detachments. We gave one striking instance of the ill-working of the present system in this respect, in which a remedy was only obtained by a return to the evils sought to be removed by the change of 1838. The native subordinates of this branch of the department are described in similar terms to those in which we spoke of the Maistries' department. There are no European Overseers in any but the Saugor Division; and the conduct of those has been not less satisfactory than of those employed in the Civil Department already spoken of.

The roads in Military cantonments: Paras. 190 to 192.

In closing our sketch of the Military branch of the department, we referred to the roads in the cantonments, and suggested some alterations in the system of managing them, intended to remedy some practices which seem liable to abuse.

Changes proposed in the Military Department: Paras. 193 to 205.

654. The changes which we proposed in the Military Department, were directed chiefly to the removal of some anomalies and inconveniences resulting from the mixture of duties now laid on the Military Board and the Chief Engineer; viz., from those authorities being charged with local duties, inconsistent with their functions of general control, and incompatible with the effective performance of those duties. We stated all the detailed local duties required of the Board and of the Chief Engineer respectively, and stated the distribution of those duties which appeared to us to be the best, and recommended that in order to provide for the due discharge of those from which the Military Board and the Chief Engineer ought to be freed, the Superintending Engineer should be changed into an Inspecting Engineer, and his Assistant into an Executive Officer, with a sufficient staff of subordinates, including European Warrant or Non-commissioned Officers for the out-stations of the division.

As respects the structure of the department in the interior, we recommended that the Superintending Engineers of the Saugor and Mysore Divisions should be made Inspecting Engineers; the number of Executive Officers in the former to be completed to four, so as to relieve the Inspecting Engineer of all such duties; and in Mysore four District Engineers for the four revenue divisions to be appointed, with an Executive Officer for the extensive cantonment of Bangalore. We recommended that the Superintending Engineers of the Nagpore and Hyderabad Divisions should be abolished, and Executive Engineers substituted; the former to be placed

placed under the Inspecting Engineer of Saugor, and the latter under the Inspecting Engineer of the new second division, to comprise the two districts of Guntoor and Masulipatam. With regard to the stations within the frontier, we did not propose any change of the existing system, but we observed that there would be much improvement in its working, when the subordinate department should be made efficient, and the whole department stronger; and when the whole should be under one controlling head, as we intended to propose, instead of the present divided authority.

The 5th Section: a single new Board proposed for all Public Works: Paras. 206 to 211.

655. Having thus completed our review of the present condition of the Public Works Department in its three separate branches, we proceeded to the consideration of the best mode of remedying the defects which we had discovered in it; and we first addressed ourselves to the controlling authority. This occupied our fifth Section, in which we advocated the abolition of the three distinct controlling offices now existing, and the creation in their place of one Board, to have control over the department in all its parts.

We first briefly re-stated the defects noticed in the working of the existing system; viz., first, the heavy and increasing work of the Public Works Department of the Board of Revenue, far beyond the powers of its members to deal with, occupied as they are with their revenue duties, and the great deficiency of the professional element in that Board; second, the anomalous position of the Superintendent of Roads, in nominal charge, both superintending and executive, of an enormous extent of roads, but without local assistance, and restricted in fact to a very small district; and third, the helplessness of the Military Board from the want of agents in the provinces. And we stated the advantages of unity of purpose and harmony of arrangements attaching to a single head. We stated our reasons for preferring a Board to a single officer, viz., the vast amount of work to be done, beyond the power of any one man, even though well assisted; the expediency of having more than one opinion on many of the questions that would occur; and the advantage of obtaining experience from all parts of the country, and all species of work, in a department embracing so extensive a range both of territory and of duties.

Proposed constitution and duties of the Board: Paras 212 to 232.

656. We then stated the constitution which seemed to us the best for the Board; viz., that it should consist of a Revenue Officer from the Civil Service, and two Engineer Officers, besides the Chief Engineer *ex officio*. And we detailed the salaries which seemed proper for the Members and for the Secretary, placing them at such sums as seemed necessary to ensure the power of selecting the fittest men, but no higher. And we enumerated some appointments which might be abolished if this new Board were constituted. We then briefly stated our opinion as to the powers to be vested in the Board, advocating considerable relaxation of the centralisation now prevailing, and the expediency of assigning power to the Board both to authorize works and to sanction bills in certain cases, taking for our rule in great measure the practice now existing in Bengal; and also urging the good policy of allowing some discretion in the authorizing of works, to the officers in the provinces. And we recommend that both the Board, and the local officers through the Board, should bring under the notice of Government by annual reports, their operations respectively under the discretionary powers so to be granted to them. After suggesting that accounts current should be kept both of irrigation works and of roads, but more particularly of the former, so that Government might be periodically reminded of their real value and importance, and preserved from always looking at the outlay only, we concluded the section with a few suggestions as to the course to be followed in transacting business within the Board, and between the Board and other authorities.

The 6th Section.

657. Having thus arrived at conclusions respecting the best constitution for the Controlling Office at the Presidency, we next went on to the consideration of the provincial branches of the department; and in dealing with that part of the subject, we first examined the amount of work to be done in its two great divisions, irrigation and roads, and then discussed the fittest agency for doing it. The first part of this inquiry occupied the sixth and seventh Sections.

The works of irrigation.

The object of the sixth Section was to present as correct a view as we could arrive at, of the present condition of the Government irrigation works throughout the

the country, and to exhibit proofs of the great importance of bestowing more attention on their maintenance and extension. In our endeavours to obtain an accurate idea of the present condition of the works, we much felt the inconvenience of that entire absence of statistical records respecting them, to which we have already adverted. Being destitute of such help, we used the best means that offered of attaining the knowledge aimed at.

Their neglected condition: Paras. 234 to 240.

658. We first took the amount of annual revenue immediately dependent on those works, being 150 lacs of rupees, and from their capital value thence deduced at a very low estimate to be at least 1,500 lacs of rupees, we inferred that the sum now devoted to their repair and preservation must be too small. And we found this inference confirmed, by the fact that in every district the tanks and channels now water less land than they did formerly, in consequence of having been allowed to fall into disrepair; and we arrived at the conclusion, that in the 12 chief irrigation districts only, there is land formerly irrigated and productive, but now waste for want of water, which if supplied with water would yield a revenue of 47½ lacs of rupees annually.

We also quoted the testimony of the Civil Engineers, being certainly the officers best qualified to give an opinion on the subject, as to the generally neglected state of the works of irrigation. Most of these officers spoke of them as having undergone material improvement in the course of the last 15 years, but as being still very far below their proper point of efficiency; and in the Northern Division, where the works have certainly been more entirely neglected than elsewhere, they are even stated to be worse now than they were 20 years ago.

Examples of the benefit of attending to the irrigation.

659. Such being found to be the general condition of the works, we next took the instances of those districts in which more has been done than elsewhere for the improvement of irrigation, and compared the revenue results with the expenditure. And we there found full proof that this course of improvement is highly profitable to the Government. The instances taken were Tinnevelly, two talooks of South Arcot, Tanjore, and Rajahmundry.

In Tinnevelly District: Para. 241.

In the first named district no works of magnitude had been undertaken, but attention had been steadily paid during a period of about 15 years, to the repair and improvement of the existing works, the influence of which on the revenue would naturally be less marked. Yet comparing the revenue from irrigated land during a period prior to the commencement of these operations with what it was during their course, we found that an outlay of three lacs and a quarter of rupees in the 15 years, had produced a return of nearly 20 lacs.

In South Arcot: Para. 245.

660. The case of the two Southern Talooks of South Arcot is more striking. These two talooks possessed of a very rich soil were formerly abundantly irrigated from the Coleroon river; but after the accession of the East India Company to the Government of the country, they shared in the general neglect of the works of irrigation. The fine channels which watered them were allowed to become choked with deposit; the revenue fell off from three lacs in the time of the Nabob, and two lacs during the earlier period of our rule, to one lac and a quarter; and the people were reduced to poverty and despondence. In 1836, the improvement of the irrigation was taken in hand; the channels were cleared out, and an anicut was erected across the river to fill them. The revenue and the prosperity of the people immediately revived. The revenue, which in such a case is an excellent criterion of the general welfare, rose till in 10 years it exceeded three lacs; and though it has fluctuated, under the operation of causes which we have noticed, and which are capable of easy removal, the average amount since the very year when the anicut was constructed, has been *Rs.* 2,37,146, whereas the average of the 11 years preceding the improvements was only *Rs.* 1,22,065. The total net gain in revenue in 14 years has been above 18 lacs, in return for an outlay of four and a half lacs; and the improvement is a permanent one, as only a very trifling yearly expenditure on repairs will be necessary to keep up the revenue at its present high standard.

In Tanjore: Para. 252.

661. Tanjore is a district which has for ages been largely irrigated from the Cauvery river. Even here too this very essential part of the revenue administration was neglected in the early times of the British Government, though not to the same extent as elsewhere; and here too we found that increased outlay on the works of irrigation, to the amount of nine lacs in 20 years, chiefly on repairs and minor improvements similar to those in Tinnevelly, had returned an increase of

revenue

revenue to the amount of 26¼ lacs, besides an addition of wealth to the Merasdars and occupiers of the soil, to the amount of about 79 lacs. In further illustration of the effects of irrigation on the prosperity of Tanjore, we quoted two striking passages from Colonel A. Cotton's report on the then proposed irrigation of Rajahmundry, in which he contrasted the state of the former province possessing irrigation, with that of the latter without it. Those extracts are well worth attention.

In Rajahmundry: Para. 270.

662. The last instance which we gave of the powerful influence of irrigation to augment alike the Government revenue, and the prosperity of the people, in other words to create wealth, was that of Rajahmundry. That district, with a part of Masulipatam, forms the delta of the Godavery river. It had long been possessed of partial irrigation; but the channels by which the water of the river was to be conveyed to the land, had been more entirely neglected under our Government than even the works in other parts of the country. And this cause, added to the decline of the trade in piece goods, of which formerly the district had a large share, had acted fatally on the prosperity of the province. Commerce was stagnant, the revenue was falling off, the population was decreasing by emigration to more favoured regions, and the people who remained were apathetic and hopeless.

It was under such circumstances that Colonel (then Captain) A. Cotton brought forward in 1844 his proposal for an anicut across the Godavery, with a system of channels for distributing the water over the district; it was approved by the Honourable Court, and shortly put in course of execution. We have given in its proper place, a somewhat lengthened notice to this undertaking; we will here only briefly state the results. The works commenced early in 1847, and up to the present time about 13 lacs of rupees have been expended; the total ultimate cost is estimated at 24 lacs. Such was the combined effect of the circulation of capital, the employment for labour and the supply of water, that in every year since the works began the increased revenue above that collected previously, has exceeded the amount expended on the works; and at the end of the year 1850–51, the aggregate of such gain was 19½ lacs, while the expenditure was under 13 lacs; so that the Government were in fact never at all out of pocket by the works. And the change in the condition and demeanour of the people is stated to be not less gratifying; industry and cheerful activity having taken the place of the former apathy and despondence. And the future prospects of the undertaking are still more promising: looking to the extent of land capable of irrigation, it seems reasonable to expect that at a very moderate rate of assessment, the works will ultimately yield in revenue a net return of cent. per cent. upon their cost; while the wealth of the people will be enormously increased.

Results of all the improvements undertaken: Para. 271.

663. As an additional instance of the great importance of irrigation as it respects the revenue, we quoted Appendix (Z.), being a statement of all the expenditure by Government for a series of years in extending irrigation, together with the results. It appears that the whole outlay for the extension of irrigation, as distinguished from the repair and maintenance of existing works, during the 14 years included in that statement, was *Rs.* 5,41,116; and the total average net yearly gain in revenue, after deducting the cost of current repair, was no less than *Rs.* 3,76,737, being 69½ per cent. on the outlay. And this is not the return from selected successful works, but from the whole of those undertaken, including a very few which from particular causes gave no return. Looking at the very small amount of expenditure shown in that table, and comparing it with the vast number of works scattered all over the country, the creation of former dynasties, we could not avoid the reflection that if the present powers had always ruled in the country, it would now have been destitute of those valuable sources of wealth.

The ill effects of neglecting the irrigation: Para. 276.

664. Having given these instances to show the great advantage of maintaining and extending irrigation, we offered a few remarks as to the loss sustained by the Government, as well as inflicted on the Ryot, when the works on which the revenue of the one and the very livelihood of the other, so much depend, are allowed to fall into decay. We then quoted in support of our views of the importance of irrigation, the recorded sentiments of two gentlemen who, both from their talents and their position, had peculiar facilities for judging on this question; viz., Mr. J. Sullivan and Mr. C. R. Cotton. And after a few reflections on the same general topic, we adverted to the immense value of irrigation in another aspect; viz., for the prevention of the destructive famines which prevail periodically in many parts

of the country, where advantage is not taken of those means of guarding against them so bountifully afforded by Providence.

Notice of the famine in Guntoor: Para. 288.

665. To enforce this lesson, we dwelt on the effects of the famine in Guntoor in 1832. We found reason to believe that of the population of that district, amounting to 512,000 immediately before the famine, no fewer than 200,000 perished by that visitation and the consequent disease: besides multitudes more who forsook their homes, and fled to other parts of the country; and that even yet the population of the district has not fully recovered itself. We calculated also that the direct loss of revenue to Government in consequence of the famine, has been very little less than 93 lacs of rupees; while the losses of the Zemindars and of the Ryots, even leaving out of calculation those of the trading and manufacturing classes, have amounted to 124 lacs; making a total of above two and a quarter millions sterling. And all this enormous amount of misery and loss would have been prevented, if the same pains had been taken to turn the Kistnah river to use in irrigation, as was ages ago bestowed upon the Cauvery by the native rulers of the country; and it may confidently be trusted that when the anicut now at last in course of construction on the former river shall be completed and in operation, such a tremendous calamity can never again occur, in that part of the country at least.

Objections answered: Para. 295.

666. Having thus stated the case in favour of maintaining and extending irrigation, we noticed a few objections sometimes urged against that policy. The first is, that there is sufficient food in the country already, and that consequently the means of raising more are not wanted and would not be made use of. In reply, we observed, that the argument is entirely opposed to past experience, whether we look at the whole history of such a country as Tanjore, and compare it with Guntoor or Cuddapah; or whether we take the results of all the improvements on which we had remarked in the earlier part of the section. Another objection is, that there is not labour in the country to execute works, or to take advantage of them if completed. But we showed the futility of this by an appeal to actual facts; viz., the emigration constantly going on from a people singularly averse to leave home and family; and the abundance of labour always forthcoming for undertakings within the country, both public and private, whenever called for; and we pointed out that labour is certainly more abundant here than in England, where people are constantly crying out that the market is overstocked with it.

And lastly, referring to the objections that there is not sufficient agricultural stock, or a disposition to extend cultivation, we showed that both are imaginary.

An exceptional case: Para. 303.

667. We then noticed one improvement of an irrigation work which has not yielded a direct profit to Government; viz., that of a channel in the Trichinopoly District, in connexion with the Upper Coleroon anicut; and pointed out that the object of this work was not at all to gain increase of revenue from the channel itself, but that it was a necessary part of the general plan for improving the watering of Tanjore, which has most abundantly succeeded. And we concluded the section with the suggestion of a few measures not immediately connected with irrigation, but such as our examination of the subject had forced upon our attention as calculated to promote powerfully, though indirectly, the prosperity of the country and of the revenue, through the means of irrigation works.

General suggestions: Para. 312.

The seventh Section.

668. The seventh Section was devoted to an examination of the present actual state of the roads throughout the country, and to the endeavour to show the urgent necessity that exists for some general and vigorous effort for their amendment. In the same section we also noticed the harbours of the coast, and the necessity for attending to them. In dealing with this subject, we had the advantage of means of information, of a kind which we have already adverted to as wholly wanting in the case of the irrigation works, viz., a series of periodical reports upon the condition of the roads. At the same time that the Road Department was formed, viz., at the beginning of 1846, the Government issued a judicious order, directing that every Collector should report annually on the state of the roads of his district; these reports, though in some respects defective, afford on the whole a useful body of statistical information. We have given an analysis of them, with such additional information as we could obtain from some reports of the Civil Engineers; with the view of showing, as well as our means enable us, the present condition of the roads in each district, and what the present system has done during the last six years, and is now doing, for their improvement. In that sketch we would particularly point to the account given of the roads in Ganjam, Rajahmundry,

The Collectors' reports on the roads: Para. 325.

Rajahmundry, Masulipatam, Nellore, Bellary, Cuddapah, Kurnool, and North and South Arcot, to show what the roads are; and to the notice of Canara, for evidence of the vast benefit obtainable by a judicious expenditure upon them.

669. From the detailed abstract of the Collectors' reports we next proceeded to present a general view of the state of the roads, as deduced from those reports. We found, that in the extensive provinces composing this Presidency, having a total area two and a half times that of England and Wales, and a population one-fourth more numerous, there is no more than about 3,400 miles of what in the returns is called "made road;" and that even of this small extent, a great part has never been made at all, being only tracks where the soil is of so firm a character as to bear a very light traffic in dry weather, without requiring much repair; and further, that another very large portion of the so called "made road" is very imperfectly provided with bridges, and is therefore still closed for a considerable part of the year. We found that nearly all the most important lines for commerce, being those connecting the Coast Districts with the interior, still remain entirely neglected; and that even of the great military lines, which have received a larger share of the attention of Government, there are but very few in good order; while the greater part are in an utter state of ruin, or more properly speaking, have no existence at all as roads, being unmade, unbridged, and intercepted by frequent swamps and ravines.

Condition of the roads of the country: Para. 377.

And if such is the condition of the main lines of the country, it is not surprising that the roads generally, those by which produce ought to reach those main lines, are far worse. In point of fact, whole Provinces are almost entirely destitute of roads, without the means of bringing their products to a market; and as a necessary consequence, industry and trade are stagnant throughout these extensive countries. As instances, we referred to the two districts of Bellary and Cuddapah, each of them more than one-fourth of the size of England, and containing together a population of nearly 3,000,000, and yet having no more than 31 miles of made road throughout their whole extent.

670. We went on to remark that the character of the Collectors' reports is not satisfactory, because not indicating generally an adequate conception of the importance of the subject; and that the tone of the orders of Government upon those reports, affords still less encouragement as to future progress. We observed that the general tenor of those orders indicates an indisposition to grapple with the question; and a disinclination to receive the real truth respecting the actual condition of the roads and the consequent evils, as plainly and faithfully stated by some Collectors. On the contrary, the Government overrate both their efforts and sacrifices for the improvement of the roads, which whether compared with the vastness of the object in view, or with the resources of the Government, are puny and insignificant; and also the results effected by those efforts, which though very sensibly and beneficially felt in a very few favoured localities, have left the vast bulk of the country wholly unaffected.

The Collectors' reports and the orders of Government: Para. 382.

671. Referring to the sentiment much dwelt upon throughout these orders, that the work of making roads is one to be performed by the people themselves, we argued that the people at large cannot be required to make the great trunk lines. And citing at some length the actual results obtained by this unpaid system in some districts appealed to by the Government as examples of what ought to be done in all, we showed that in those districts, especially in the one most insisted on, the circumstances were eminently favourable, compared with what would be found in other districts, and that nevertheless the results have been very small; and that so far from proving that the roads can be made by the people, they prove the very reverse, viz., that if such means be mainly relied on, the country can never possess anything like good roads.

The people cannot make the main roads: Para. 386.

We then adverted to the surplus ferry receipts as a resource for local improvements, and pointed out that although this fund was formally ordered by the Honourable Court 35 years ago, to be given up to such objects, the order has never been acted on, but the amount has invariably been swept into the General Treasury.

The Ferry Funds: Para. 392.

672. We next proceeded to consider the value of good roads; and after quoting a striking passage to illustrate their effect in promoting social improvement we went on to speak of their great and peculiar influence in this country in augmenting the revenue, which here depends so immediately on the demand for agricultural

Beneficial effects of road improvements on the Government revenue: Para. 395. Example in Canara: Para. 398.

tural produce and the extension of cultivation. As an instance in point, we took the District of Canara, where, during the last 16 years, a good deal has been done to open the interior of the country to the coast. We found, that while the whole outlay on these improvements has been only *Rs.* 5,25,000, the total increase in the land revenue during the same period above the average of a number of years before, has been *Rs.* 16,39,575, and in the revenue from the salt monopoly it has been *Rs.* 15,60,488, making a total of *Rs.* 32,00,063. And deducting even as much as one-half of this gain as possibly due to some other causes which have been in operation, we have a sum of 16 lacs of rupees clear gain in revenue in this short period, attributable we fully believe, and the Collector upholds us in the belief, to no other cause than the judicious expenditure of five and a quarter lacs in the improvement of the roads.

Contrast in Ganjam and Vizagapatam: Para. 403.

673. And in order to enforce the lesson to be learnt from this example in Canara, we took the two districts of Ganjam and Vizagapatam on the Eastern Coast, which very closely resemble Canara in geographical position, but differ from it in the entire absence of any considerable attempts to improve their roads, and especially to open passes into the interior. We there found, that instead of an increase of 50½ per cent. as in Canara, the salt monopoly shows an actual falling off of five per cent. during the same period. This decline is probably due to an increase in the Government monopoly price which was made during the interval; but that increase extended to Canara also, but was there counteracted by other influences.

The Western Trunk Road: Para. 404.

So also with the Western Trunk Road from Madras; we had not the means of ascertaining its effects on the land revenue of the districts through which it passes; but we found that the increase of revenue from the larger quantity of salt sold at Madras, in spite of the augmentation of price, and clearly traceable to the improvement in the road, has been far more than sufficient to pay for the whole cost of the road.

Sketch of a system of main roads: Para. 407.

674. We then sketched out a system of main lines of communication for the whole Presidency; to consist, first, of lines running inland, from the coast: second, of lines running along both coasts; and third, of roads connecting principal places in the interior. Of these three descriptions we computed that 7,700 miles would be required, of what are called first-class roads, besides the subsidiary lines, the mention of which we reserved for the following section.

Really good roads are required: Para. 413.

We concluded that part of the Section with a discussion upon the degree of perfection which should be aimed at in our roads; contending against the opinion brought forward by the late Superintendent of Roads, and adopted by the Government, that really good roads are not wanted in this country. We argued against that opinion, and stated both facts and calculations to show it to be erroneous; and which we think fully bear out the conclusion at which we arrived, that far from its being true that the common tracks slightly improved will suffice for this country, a very moderate amount of traffic is sufficient to pay for making a first-class road and for keeping it in perfect repair; and that it is truly wise and economical to make and maintain such roads.

The seaports of this Presidency need attention.

675. The latter part of the Section was devoted to a brief notice of the harbours of the coasts of this Presidency. We first described these harbours as being considerable in number, and formed generally by basins or backwaters within the mouths of rivers; and we lamented that having been almost wholly neglected, many of them have very much deteriorated within memory. We made individual mention of some of these ports, and stated what has been done for them where they have received any attention at all, and what further they require. We

Coringa and the Godavery Navigation: Para. 427.

spoke of Coringa at the mouth of the Godavery, already a thriving commercial and ship-building port, and noticed its rapid increase since the irrigation works on the Godavery were commenced, and the certainty that it will be a place of great trade. But we mentioned how sadly its great advantages have been neglected, so that it is far less commodious now than it was 20 years ago, and all from mere neglect. In connexion with the Port of Coringa, we adverted briefly to the vast importance of opening the noble Godavery river on which it stands, to navigation. We quoted facts to show the enormous advantages which would thence result, both to

Cochin and other ports: Para. 440.

commerce, and to the Government revenue, as well as to the great saving which would so be effected in moving troops and stores. We spoke also of Cochin, a port on the Western Coast, only second in importance to Coringa, and like it excellently situated, both for commerce and for shipbuilding, and already possessing extensive business of both

both kinds. And we noticed Masulipatam, Negapatam and other ports of minor importance, describing the wants of each, and mentioning what little has been done for them.

A special fund for improving the harbours exists: Para. 449.

676. We adverted to the fact that though an increased rate of port dues was imposed a few years ago, of which the proceeds were to be devoted to the lighting and improvement of the harbours, and though the fund thus formed now amounts to nearly a lac and a half of rupees, yet the Government have again and again refused most trifling expenditures, for averting the progress of decay in several ports, or for effecting improvement. And we pointed out that even taking the narrowest possible view of the interest of the Government in this question, limiting it to the bare amount of the port dues received, yet in those dues there is an abundant fund for effecting all that is desired. Both at Coringa and at Negapatam the merchants and shipowners have declared their willingness that the port dues shall be doubled, provided only the proceeds are expended in improving the port; and funds abundantly sufficient for all that is necessary might be obtained without advancing a rupee of Government money, by adopting the course so universally and so beneficially followed in England in such cases, viz., that of raising money on the security of those dues. Much knowledge has been obtained within a comparatively recent period in England in the treatment of such cases, and some of the most important ports in Great Britain, Liverpool, Glasgow, Newcastle, &c., are fully as much indebted to the skilful application of human ingenuity as to natural advantages. It is earnestly to be desired that some little of the experience acquired on those works should be brought to bear on the harbours of India; a very trifling expenditure in that way would do much to relieve trade here from very serious impediments.

The Paumbam Channel: Para. 456.

After suggesting a few measures calculated to ensure due attention to the conservation and improvement of the ports, we concluded with a brief notice of the operations carried on for some years past for deepening and straightening the Paumbam Channel, and the consequent very material enlargement of the trade passing through it; a result gratifying both in itself, and for the evidence it affords of the readiness of the commerce of this country to spring up, whenever relieved from the depressing causes which so generally bear it down.

The Eighth Section.

677. Having thus investigated the amount of work to be done in the country, in both the species of improvement which we had been discussing, we came next to the consideration of the amount to be devoted to that object; and this occupied our eighth Section. After declaring that the expenditure, though materially enlarged of late years, still appears far too small, we went on to consider the proper sum to be set apart for the three following objects; the maintenance of the existing works of irrigation, the construction of new ones, and the formation and improvement of roads. We did not here speak of the harbours, because it is clear that the funds necessary for their improvement may be easily and naturally obtained, without even an advance of money on the part of Government.

Proper amount of expenditure on irrigation: Para. 463.

As to the first of those three objects, the works generally being out of order, as already shown, they will need a somewhat larger expenditure for some years to come, until they shall all be gradually brought into good repair, than will be necessary afterwards. We propose that 15 lacs of rupees should be devoted annually to the object of efficiently repairing and maintaining the old works, being about double the amount laid out on that object now. The examples of Tinnevelly and of Tanjore, detailed in the early part of Section 6, are abundantly sufficient to show how amply such increased expenditure will be repaid. As to the formation of new works of irrigation, considering the great extent of the field to be so occupied, but limiting our estimate of a year's work by a regard to the means likely to be available for directing expenditure, we proposed seven and a half lacs as the ordinary amount to be devoted to this object every year: making a total of 22 and a half lacs annual expenditure in maintaining and extending irrigation.

A special fund, not a part of the Government Revenue, set apart long ago for maintaining the irrigation works: Para. 464.

678. In speaking of the maintenance of those works, however, we stopped to observe that it is a serious mistake to look upon the whole amount so spent as an outgoing from revenue. We showed that the Government had appropriated to themselves and included in the revenue settlement, a very large annual income, forming no proper part of the Government revenue at all; but consisting partly of payments contributed by the Ryots themselves for the maintenance of their tanks and channels, out of their own share of the produce; and partly of joint funds for

similar objects, formed by such contributions united to sums assigned by the Government out of its revenue, which latter even could no more be justly considered as still Government revenue, than the amount of a "grant in aid" awarded by the Council of Education, can still be regarded as a part of its disposable funds. We found that the Government having merged this separate fund in the general revenue, came entirely to forget its origin, and to look upon the cost of maintaining the works as a mere drain on the Treasury, forgetting alike the great profit to itself from the expenditure, and also the fact that in reality it was no expenditure at all from its own resources, but only from a fund held by it in trust for that particular object. We stated our opinion that this trust had not been adequately discharged, as proved by the generally neglected and inefficient state of the works. And we concluded with stating the three motives obliging the Government to a liberal expenditure; viz., 1st, that having assumed the "tank and channel fees" on the condition of maintaining the works they are bound so to maintain them: 2d, that independently of this direct obligation, there is a second virtual obligation, arising from the fact that a vast amount of capital has been invested in the land under the works on the faith of the engagement of Government to keep them in repair: and 3d, that such a course is most remunerative through increase of revenue.

Extent of roads required: Para. 467.

679. In estimating the sum to be assigned annually to the construction of roads, we first computed the extent of road required to form a system of intercommunication throughout the country, and the probable cost. We divided the roads into three classes; the first composed of the main commercial and military lines of the country; the second, of roads to connect towns and places of second-rate importance; and the third, of the village or cross-roads to connect the villages with towns, or with roads of the superior classes. We calculated that the first-class ought to comprise 7,760 miles; the second 20,000 miles; and the third, 150,000 miles. The two former we proposed to be constructed by the Government; the last by the people of the respective localities. We vindicated the justice of the length here stated, by a comparison of the length of communication of the different kinds actually existing in England, and by comparing the extent and density of population of the two countries; and we then proceeded to calculate the cost of constructing and of maintaining the roads of the first and second classes.

Their cost: Para. 470.

680. We estimated that the first-class roads would cost *Rs.* 3,500 a mile, but that 1,200 miles of the distance might be navigable canals along the coasts, to cost only *Rs.* 3,000 a mile, and for the 8,000 miles (in round numbers) the total cost would be 274 lacs. The second class we supposed would cost *Rs.* 2,500 a mile, being for 20,000 miles, 500 lacs: making a grand total of 774 lacs of rupees, or $7\frac{3}{4}$ millions sterling, for the formation of a system of internal communications for the whole of this extensive territory. As to the cost of repairing and keeping up these roads, we estimated that after the whole are completed, which in the nature of things cannot be for very many years, the annual charge on that account will not be less than 80 lacs of rupees. After considering the question of tolls, and expressing our opinion that they might be gradually introduced, and that ultimately they might be made to supply a very large part of the whole cost of maintaining the roads, we stated our opinion that 20 lacs of rupees a year ought to be steadily devoted by Government to the great work of creating a system of communication, the amount to be increased largely, as the resources of the State shall grow under the influence of such measures of improvement, and as the means of spending money to advantage become augmented.

Their effect in saving the cost of carriage.

681. And in order to modify the astonishment which we foresaw would be excited by the mention of the large sums which we have named, we gave a small statement to illustrate the annual value of the roads contemplated, from which it appeared, that on a moderate estimate of the traffic to be borne on them, they would, after paying their own charges, effect a saving in the cost of transport, to the enormous amount of 960 lacs of rupees every year, besides vastly increasing trade as a necessary consequence, and rendering commercial interchanges profitable, which at present are totally impracticable. Thus, large as the cost of the roads appears, their actual use in every single year, strictly valued in money, exceeds their whole capital cost. And it cannot be too often repeated, that improvements in this country literally cost nothing; whether laid out on roads or on works of irrigation, money expended is returned almost immediately, and a permanent addition is made to the resources of the Government and of the country.

682. We

682. We next noticed the cart tax in the Salem District, imposed a few years ago for the repair of the roads, and the small produce of which is laid out on that object; and after detailing the history and incidents of the impost, we recommended that when the new system which we advocate is introduced, this tax should cease.

The cart tax in Salem: Para. 475.

We then reverted to the subject of the village or cross-roads. We declared our opinion, that it would be no hardship on the 56,000 villages comprised in this Presidency, to oblige them to make and maintain 150,000 miles of cross-road for their own use and convenience; and that, in fact, no other means of completing the system of general communications could be found, the task being clearly beyond the powers of the Government. We stated our belief also, that the obligation would be cordially recognized and cheerfully fulfilled, provided the main lines, that is, the roads of the first and second classes are kept in good order; and provided also, the obligation is duly regulated and enforced by authority on all parties liable to it, so that the well-disposed shall not be left to do the work of the idle and evasive.

The cross roads: Para. 479.

683. On the whole, we found that the total increase of expenditure thus proposed by us, on irrigation works, on roads and on establishments, amounted to 38 lacs a year; and we next proceeded to consider how this sum could best be provided. After a few remarks to show that the real surplus of revenue over expenditure at this Presidency is much larger than it is usually considered, we stated our opinion, that whatever that surplus might be, those improvements, so essential to the advancement of the country, ought not to be dependent on any such accidental circumstance, but that whatever amount it might be deemed wise to devote to those most important objects, should be considered equally essential parts of the year's expenditure, with the pay of the army or the interest of the debt, and should be provided for as scrupulously. And we urged accordingly, that when the year's revenue fell short of the required amount, the deficit should be made good by borrowing; this being a species of loan which cannot be regarded as at all a burden on the Exchequer, because not incurred for the sake of mere expenditure, but for investment in methods morally certain to return a profit manifold greater than the interest to be paid for the use of the capital. We observed that these loans need not be permanent, but that the first proceeds of the works to be constructed by their means, might be devoted to their repayment. We supported our recommendation by an appeal to the practice of private persons, who regard their credit as a portion of their capital, and use it as such; although it is not nearly so good or so stable as that of the Government of this country.

Total expenditure proposed; how to be provided for: Para. 481.

In closing our remarks on the subject, we observed, that of the public improvements to be undertaken, the irrigation works and common roads would in general be most properly undertaken by the Government; but that on many lines, railways or navigable canals would return a very handsome profit, and that such works would properly be left to private enterprise; and we recorded a few remarks as to the way in which they should be undertaken, should be encouraged by the Government, and should be carried on.

Railways and canals to be formed by private enterprise: Para. 489.

684. We concluded the section with a suggestion, that whatever amount might be determined as proper for the annual expenditure on public works, the whole ought to be at the unfettered disposal of the Local Government. We observed that a Board or Council of Bengal Officers sitting at Calcutta cannot exercise an intelligent judgment as to the local concerns and wants of the various Provinces under this Government, and that the intervention of such a body has, in fact, acted very injuriously to the interests of this Presidency. Admitting the necessity that the Supreme Government should be kept acquainted with the financial position of this part of the empire, we conceived that this necessity, as regards the public work expenditure, would be met by an annual prospective estimate of the expenditure in that department. And we recommended, that a standard for the usual expenditure having been fixed, an estimate of the probable actual expenditure in each of the two years then next to ensue, should be prepared annually by the Board of Works; that it should be laid by the Board before Government, and having been there approved, should be communicated to the Indian Government if within the amount of the fixed standard, as the expenditure to be provided for in the two years; but that, if in any year the estimate should exceed the fixed standard, then it should be sent home for the approval of the Honourable Court, and having been there approved and confirmed, should be communicated to the Supreme Government.

The whole amount of the expenditure to be at the disposal of the Local Government: Para. 492.

The ninth Section. Remarks on "Superintendence:" Para. 495.

685. In the ninth Section we detailed the establishment, which, after careful consideration, we deemed it essential to maintain for the economical execution of the work, on the scale now prevailing or likely to prevail in the Public Works Department. Various circumstances had made it plain to us that much misconception existed as to the use and value of skilled establishments, and of what is called "Superintendence;" and much jealousy of any increase in that item of charge, founded on such misconception. We deemed it advisable, therefore, to open this section with a few remarks on the general subject of superintendence; designed to show its true character. We pointed out the five distinct functions included in the term, often unthinkingly, and showed that, to judge of the sufficiency or the excess of superintendence in any given case, as is so often done, by comparing the charge on that account, with that of the whole work, must be wholly fallacious in respect to every one of the five particulars; and that, as regards most of them, it would lead to an inference the very reverse of the truth. And we gave several reasons why both the quantity of oversight in the execution of work, and its money proportion to the cost of the work, ought to be larger in this country than in England, though in fact we believe it is not so large. We also adverted to the enormous losses sustained formerly through the great deficiency of superintendence, and the undoubted gain in efficiency through the measure of increase since obtained in that item. And we also pointed out the good effects that would result from a system of effective management of the works of irrigation, for the prevention of that wholesale waste of their water which now prevails; a species of "Superintendence," hitherto almost unknown under this Presidency.

The want of officers: Para. 511.

The proposed establishment.

The Commissioned Officers: Para. 525.

686. We then dwelt upon the duties of the Civil Engineers, in order to show how inadequate their number is to the due performance of those duties, and gave a number of instances exemplifying the very heavy loss to Government in consequence; and we then went on to state our proposed establishments. We need not here recount our propositions on that head. We will only observe that the general division of the establishment is into four branches, as at present; viz., Commissioned Officers, Warrant and Non-Commissioned Officers, the Native Executive Agents, and the office servants. We propose a material augmentation of the commissioned grades, but still larger of the lower grades; for it is undoubtedly one most wasteful defect of the present establishments, that from the deficient numbers of the inferior grades, officers of all ranks except the very lowest, are constantly and of necessity engaged in operations which men of greatly inferior qualifications and inferior cost would perform as well or better. Thus the Revenue Surveyors, and even the Assistant Civil Engineers, are obliged to copy their own plans for want of draughtsmen, and their own diaries and letters for want of writers; though five writers or draughtsmen might be procured for the pay of one Revenue Surveyor; and a Civil Engineer with ability to project and plan works for the improvement of whole talooks, is occupied in taking levels and surveys, for want of the aid of a few surveyors on one-eighth of his pay; and this grievous waste has hitherto been thought good economy.

The subordinate grades to be much increased: Paras. 584 and 585.

687. We have guarded against this evil by providing a much larger proportion than hitherto of the subordinate grades; yet still smaller than it will hereafter be in the power of the higher grades of officers to control and direct efficiently. The number of commissioned officers which we propose is absolutely necessary even now, with reference to the enormous extent of the divisions, and we have assigned the proportion of subordinates of all grades suited to the works now done or likely to be done; but hereafter, as the quantity of work increases, and so becomes more dense over a given area, it will be possible still more to increase the numbers of the subordinate grades and so the efficiency of the whole body, without a commensurate augmentation in the highest classes. Among the subordinates we propose a large increase of the European warrant and non-commissioned grades, and a considerable improvement in their emoluments; the excellent conduct maintained by the men of that class hitherto employed, under very discouraging treatment, fully justifies our anticipation of the most beneficial results from their larger employment, and on more important duties.

Salaries and promotion: Paras. 539, 554 and 565.

We also stated the salaries proposed for all the grades of officers to be employed; and we saw reason to advocate an increase in the case of many, though not in those of the highest ranks; and we also detailed the rules which seemed expedient for regulating the course of promotion in the department, and likewise with reference to the authorities to whom the duty of promoting or recommending for promotion

promotion should be entrusted, as well as that of selecting for particular appointments and duties.

The tenth Section.

688. The tenth Section discusses the best mode of providing and of training men for all the various grades of the Public Works Establishment. It begins with the commissioned officers. We first considered how the required number of professionally educated Engineers could be best obtained; and we arrived at the conclusion that the best course would be to enlarge the Military Engineer Corps. We believe no other system would supply the qualifications wanted, so efficiently and so cheaply; especially with reference to the high tone of honourable feeling established in the corps.

Number of Engineer Officers required: Para. 576

We next proceeded to consider the extent of the increase necessary to the Engineer Corps, in order to provide the number of officers contained in the proposed establishment. That number is 85, counting those appointments only which absolutely require professional acquirements, to the exclusion of nearly all the executive appointments, and taking no notice of many other duties which we enumerated, and for which demands will certainly be made on the Engineer body. Having carefully investigated the proportion of officers absent from duty for a series of years, as well in the Engineers as in the other branches of the army, we found that it would require a corps of 112 officers, to have 85 always available for duty. We recommended that this number should be organized in four battalions, of a composition which we specified; and that the present two battalions should be immediately increased to three battalions of that strength, but that the fourth battalion should be raised gradually in six years, so as to avoid the inconvenience of having too large a proportion of very young officers.

Comparison with the other Presidencies: Para. 585.

689. Comparing the proportion of Engineers to the rest of the army under this Presidency with what it is under the other Presidencies, we found that after the augmentation which we recommend, that proportion here would be only equal to what it is already in Bombay, while it would be somewhat higher than it is now in Bengal; and we pointed out that the simple fact of the existence of a vast system of Government irrigation works in this Presidency, requiring the constant attention of the Engineers, is sufficient to render a larger proportion necessary here. We expressed the opinion that though the number of Engineers that we propose may be thought large, yet that compared with the extent of territory and the amount of work, it would be thought fatally small in any other country; and that it will be thought so here in a few years.

The training of Engineer Officers: Para. 595.

690. We then briefly noticed the practice of augmenting the number of Engineer Officers available for duty, by keeping up a number of Supernumerary Second Lieutenants; and we expressed the earnest hope that it would be put a stop to, as injurious and unfair to those officers; and we then proceeded to advert to the mode of educating the Engineer Officers. We recommended that the period of residence at Chatham after leaving Addiscombe should be shortened; and that the Cadets should go through a good course of Civil Engineering, under a practical Civil Engineer, with an examination at its close. As to the course in India also, we recommended that the head-quarters of the Sappers should always be at some great work, so as to initiate the young officers early into a knowledge of the civil works of India; and we offered a few suggestions as to the employment of the Sappers on civil works.

The subordinate grades of the department: Para. 602.

691. We then went on to the subordinate ranks of the department. We first described briefly the qualifications required in those grades which seemed to need such notice, and then proceeded to speak of the best mode of supplying those qualifications; having previously however described the present "Survey School," and given our reasons for recommending its abolition, as inefficient and utterly incapable of effective improvement or enlargement.

A training institution for them is necessary: Para. 612.

We declared our decided conviction that the Government must form an institution for the training and education of the subordinates of this important department, akin to that already existing for those of the Medical Department; and we referred to the Engineering College at Roorkee as affording a model suitable in most respects to our wants. We reviewed the origin and progress of that institution, and its arrangements and course of instruction; and we pointed out a few particulars in which a modification of that system would be necessary, in order to adapt it to the requirements of this Presidency. We set forth the arrangement which we deem the most suitable for a college here, as respects the various classes both

both European and Native, which our establishment will require; and we added some remarks as to the conditions to be required in the several grades, for admission and for passing out, as well as for promotion in the department.

Further suggestions respecting the college: Para. 627.

692. We then offered a few suggestions as to the general arrangements of the institution, in particular that the English language should be the only medium of instruction, and that the college should be provided with a good library and model room, for the use of the students; and we dwelt particularly on the essential importance of imparting to the students real practical constructive skill, as well as mere theoretical knowledge. We professed ourselves unable to pronounce as to the best means of effecting this important end, but we suggested a few methods of doing it.

It should be at the Presidency: Para. 632.

With regard to the most proper situation for the school, we stated our conviction that it certainly ought to be at Madras. Though open to some minor objections, which however may be obviated, the Presidency possesses advantages which no other place can show. In particular we noticed two; viz., the great number and variety of public works always in progress, for the practical training of the pupils, and which are likely hereafter to be still more numerous and various; and the number of scientific officers of different branches of the service, or not in the service, whose aid might be secured by small remuneration, to assist the principal of the college, by giving lectures on the various branches of study.

Number of pupils and cost: Para. 635.

We closed our notice of the college with a computation of the number of students required to be maintained, and an estimate of the yearly cost. We calculated that in order to supply vacancies, it would be necessary to have always 125 pupils at the college, of whom 33 would need to be Europeans and 92 Natives; and we estimated the whole charges of the institution, comprising salaries, subsistence of pupils, the expenses of tuition and of the library and model room, and the annual cost of the buildings (viz., interest and current repairs), at about *Rs.* 60,000 a year. A charge very insignificant, when compared with the utility of the institution, the numbers of the establishment to be trained, and the enormous value of the property and the interests to be dependent on the skill and care of that establishment.

Concluding Remarks.

Our recommendations are directed to three principal points.

693. Having thus briefly recapitulated the contents of our Report, we will conclude it with a few general remarks. Our chief recommendations may be comprised in a few words; they are addressed to three main objects; viz., 1st, the past neglect of even the existing works of irrigation, and the high expediency of repairing past omissions, and entering vigorously on the task of both restoring the old works to their highest point of efficiency, and of greatly extending irrigation by new works; 2d, the utter want of anything like good roads at present, and the absolute necessity of taking measures without delay to form a general system of internal communications; and 3d, as an essential means to both those objects, the necessity of very greatly enlarging and improving the Engineering Establishments, now in all its grades lamentably below the point of true economy, even for the present meagre scale of expenditure.

Irrigation works.

694. In supporting our opinions in favour of an increased expenditure on irrigation works and on roads, we urged facts to prove the value of both, even regarded simply as means of filling the Government exchequer. As to the former, we proved that the past expenditure by our Government has been decidedly too small, and that the revenue has undoubtedly declined in consequence; and we brought forward instances to show how the revenue has immediately rallied, conjointly with and as a consequence of the more thriving condition of the Ryots, wherever the restoration or formation of works of irrigation has been undertaken on a large scale.

Roads.

As to the roads, we carefully depicted, from the best information obtainable, their condition at present; not only of the cross or country roads, but even of the vast bulk of the most important lines. We showed how this state of the means of communication paralyses commerce and enterprise, and so keeps down the revenue, by impoverishing its sources; and we gave instances to show how immediate and how powerful is the effect both on the land revenue and on that from the salt monopoly, where some little amount of attention is steadily paid to the improvement of the roads.

695. As

695. As to establishments, we found that those now existing are utterly insufficient even to direct and control effectively the present expenditure, or duly to attend to the existing works, much more to attempt anything in the way of improvements, without still more neglecting ordinary duties. We found that this truth has been acknowledged for many years past, has been brought to the notice of Government and fully recognized there, and has been pressingly represented to the Supreme Government and to the Honourable Court, but that still nothing has been done to remedy it. We found also that, of late years at least, a serious and fatal misapprehension has pervaded the Government as to the wastefulness of that expenditure which is devoted to what is called "Superintendence," *i. e.*, to the providing of science and skill to plan works and to direct rude labour; and that a tendency prevails to look upon that work as the cheapest which is effected with the least possible amount of such aid. We combated that opinion, opposed as it is to the growing experience of European countries, where, every day, science is applied more and more to even the most homely branches of industry; and where, year by year, mere labour is more and more superseded by science and skill. And we proposed an establishment much larger indeed than the present one, but not greatly exceeding what has been constantly asked for, even for the present scale of operations, and necessary for that; but yet from the scattered distribution of the work to be attended to now, competent to do much more in the same geographical extent. Establishments.

696. We will now, in conclusion, offer a few remarks on each of these three heads. And first of irrigation. There are two peculiar circumstances attaching to these provinces which must not be overlooked in considering this subject; of which one, an incident of the revenue system prevailing here, makes it especially the function of the Government to undertake such improvements; while the other, which is a natural circumstance, makes it so eminently remunerative to do so. In other parts of the empire, and in those parts which from their Metropolitan connexion represent the whole of India in the ideas of many persons, the revenue is fixed and invariable, either in perpetuity or for a term of years; and neither any improvement in the resources of an estate or village, nor any extension of cultivation, entitles Government to demand the smallest addition of revenue. Thus Government has put it out of its power to take an active part in promoting such improvements in those provinces, except by a special agreement in each case, and with each individual proprietor; but here the case is very different. Throughout by far the greater part of the Madras Presidency the Ryotwar field settlement prevails, under which every acre of land bears a certain assessment, which is paid in years when the land is cultivated, but not when it is not cultivated, and of which a part is even remitted in the case of irrigated land cultivated, when the water is insufficient to mature the crop. Here then any improvement or extension of irrigation immediately affects the revenue, almost by a natural process; for the former, viz., the improvement of existing works, leads to the cultivation of land under those works, previously waste from want of water; and the latter leads to the conversion of wholly waste land, or land formerly cultivated only with dry crops, into irrigated land; upon which conversion the assessment is increased according to certain rules; and the gain to the Ryots being so great, he gladly avails himself of the water supplied, and cheerfully pays the increased demand. And as it is the immemorial custom of the country that the ruling power should thus provide water, and in return levy an increased tax on the land, and as it is so profitable to the Ryots, they every where desire it, and the arrangements follow almost naturally. The Madras revenue system holds out peculiar inducements to the Government to promote irrigation.

697. And there is a second circumstance almost peculiar to the provinces of Madras, as compared with other parts of India, which enhances the value of irrigation here; a peculiarity not in the revenue system, but in the climate. In Northern India irrigation is valuable during the two or three dry months preceding the rains, to strengthen the crop or even as necessary to the preservation of some kinds; but the crops generally are not wholly dependent upon it, and very valuable kinds of produce are raised without it. Here, on the other hand, from the greater heat and aridity of the climate, and the longer duration of the dry season, the most valuable species of produce cannot be raised at all without constant artificial watering, and for the most part those species not so watered are very poor and scanty, while those enjoying irrigation are luxuriant and abundant. Hence it is that there is so great a difference between the value of a crop from irrigated and from unirrigated land; and that the Ryot is so anxious to obtain water, and willingly And the climate makes it eminently remunerative to do so.

willingly pays a largely increased assessment, because his profits are so much augmented by it.

A very wide field is open for such improvements.

698. And the field for this species of investment of capital by the Government is very far from being fully occupied; on the contrary, we may say that large as is the number of fine works bequeathed by former Governments, those of the very finest and most remunerative class have as yet hardly been commenced upon. We allude to works for turning to account the waters of the high floods of the rivers. In many rivers the waters of the low freshes are already turned to use to some extent, though even here there is still a vast deal to be done. But as respects the high floods scarcely an attempt has been made to preserve them for use; the Cauvery is more largely turned to irrigation than any other river of South India, and nearly the whole water of the low freshes is so used; but scarcely any part of the high floods. Almost the whole of it flows to waste in the sea; and it is the same with other rivers, the Godavery, the Kistnah, the Palar, the Pennar, and others of inferior magnitude. Here then is a vast field of improvement open: the water which now annually falls into the sea is sufficient to water many times the extent of land now irrigated. It should be stored in reservoirs to be constructed in favourable situations all over the country; reservoirs such as the tanks of Cauveripauk, Chumbrumbaukum, Cumbum, Veeranum and Cunnigherry, described in a former part of this Report, and even on a larger scale, and be drawn off as required. And not only will these works supply irrigation, they will also furnish extended lines of water carriage, ramifying over the whole country. Many years ago, the able Engineer, Colonel De Havilland, expressed the opinion that our efforts should not cease till the whole of the waters of the rivers of the Peninsula were turned to this use; but during the long period that has elapsed since that sentiment was uttered, scarcely anything has been done towards effecting the object proposed.

It is to be hoped that the liberal policy followed in North India will be imitated here.

699. And as it is shown that this species of enterprise is so profitable to the Government, and so productive of wealth and comfort to the people, such a means in short of advancing civilization, and as such numerous and splendid openings for such undertakings exist, we indulge the hope that now at length they will be entered upon. We see a liberal spirit of improvement acted on in the Punjaub, and 50 lacs allotted by a single stroke of the pen, for promoting the irrigation of that province; and we see large expenditures on similar objects under the Government of Agra: and yet we believe it to be certain that in neither of those territories will the returns, actual or expected, compare in amount with those which can be pointed to as the actual result of similar undertakings under this Presidency. We cannot believe that two such opposite courses of policy will be continued in different parts of one and the same empire; that while in one part of it a share of the resources of the State is wisely and liberally devoted to the promotion of the general wealth and the improvement of the revenue, the same enlightened policy will be ignored in another part, little if at all inferior in extent and population, and even more capable of making an abundant return for the outlay.

And the formation of roads is not less important.

700. And we cannot regard the formation of good roads as less important, or less essential to the prosperity and advancement of the country, than the extension of irrigation. The two species of improvement are intimately connected and should go hand in hand. Without the means of transport and of interchange, the most valuable products become a drug, and production is arrested; thus roads give value to produce, and large production gives a use and a value to roads. No advantages can make up for the want of the means of transport; at the present time good wheat is selling in the Berar valley at *Rs.* 5½ (11 *s.*) the quarter, and the whole cost of freight and charges from the coast to London do not exceed 15 *s.* a quarter. Yet in the absence of good roads and of all attempts to improve the noble Godavery for navigation, the cost of carriage from the place of production to the coast effectually keeps it out of the market. For at present the only means of exit for the produce of Berar is by carriage on pack oxen, either to Bombay, a journey of 60 days, or 400 miles to Meerzapoor on the Ganges, and then 500 miles down that river to Calcutta; whereas if the Godavery river, the natural outlet of that country, were opened to navigation, the cotton and other valuable produce it yields would reach the seaport of Coringa at its mouth, in 70 hours. On the other hand, a ton of salt which is sold at the Government stores on the coast for *Rs.* 27, costs *Rs.* 112 at Nagpore. We have already adverted (para. 433, &c.) to the enormous yearly loss in the carriage of the cotton of the same

same country to the sea coast by land, instead of by the river; and have noticed what large supplies of that article of the best quality for the English market, would immediately flow out, if the navigation were opened.

And they are necessary not merely to enable this country to advance, but to retain its present position.

701. At the present time, indeed, it may be said that not merely the advance of the country, but even its continued hold of its present position, depends on the formation of roads; for other countries, with the products of which those of this country must compete, are not equally stagnant. The two great staples of these provinces are cotton and sugar, which seem likely, if only the expense of carriage is lowered, to give employment and wealth to the population. The climate and soil are excellently adapted for both, and from the great abundance of cheap labour, and the vast extent of unoccupied land, they may be produced in any quantity, and at a price with which no other country could compete. But the fatal bar in both cases is the cost of transport. The competing countries are America in the case of cotton, and Cuba, Brazil and the West Indies in that of sugar: every one of these countries, even the most backward of them, possesses means of transport vastly superior to anything that we can show; all possess railways, and those in great part constructed by English capital. The money of England would speedily cover the face of this country also with the same aids to commerce and the growth of wealth, and with other enterprises; but though it is engaging in undertakings in almost every other part of the world, very little of it reaches India. We will not attempt to dive into the causes of this difference; but it is certain that if the interior of the country were more opened by means of good roads, to the access of European agents, one great deterring cause would be removed.

The sugar trade especially needs such relief at the present time.

702. At this very time the sugar trade of India is struggling for existence, and the result is uncertain. The recent improvements in the process of making sugar from beet-root are so reducing the price of the article in the great consuming countries of Europe, that the manufacturers from the cane are driven to exert all their ingenuity to cheapen their own processes. This country has enormous advantages in its cheap and abundant labour; but it seems doubtful whether these will not be overborne by its disadvantages in the high cost of carriage. We believe there is a large decrease in the export of sugar from the Madras ports in the present year, and this is chiefly in the raw sugars, on which the cost of transport bears the most heavily, and in which there is less loss from discontinuing operations, because little fixed capital is employed. In the case of refined sugar large capital is invested in the necessary machinery and buildings; and as it would be ruinous to sacrifice that, lower prices must be met if possible by extended operations, so as to do a larger quantity of business with the same plant and apparatus. But here too the want of roads intervenes. The letter in Appendix (P.) refers to such a case. In that letter Mr. Boothby speaks not only of the difficulties and losses to be encountered in sending down the manufactured sugar to the coast for shipment, from the want of a good road, and especially from the absence of bridges, but also of the difficulty and expense even in procuring the raw material for manufacture, from the entire absence of roads through the district. At such a critical time the refusal of the sum required for metalling and bridging the road from Berhampoor to Russelcondah, to which we have adverted above (para. 333), is very much to be regretted.

Particular instance of the loss from want of roads in this regard.

703. We must again beg attention to the letter just referred to, which is well worth perusal as a narration of simple facts, bearing on the important subject now before us. It is there seen that if the factory were in full work, it would circulate annually in the district no less than seven lacs of rupees; and the powerful effect exercised on the revenue by such dispersion of capital, above remarked upon (para. 262) in the case of Rajahmundry, proves how important it is to the interests of the Government to encourage such operations. Yet Mr. Boothby states (para. 2), that hitherto he has been unable to spend more than a third of the sum abovementioned, because the absence of roads made it impossible to procure the raw material. Looking at the actual results produced in Rajahmundry, as well as in Canara, it appears certain that not only the cost of perfecting the Russelcondah road, but any amount laid out judiciously in improving the roads of the district generally, would be replaced in a very few years, and would have the effect of permanently raising the revenue.

Present state of the roads.

704. A recent writer on the trade of Liverpool thus expresses himself: "Who can venture to assign limits to the trade which India will possess with Great Britain,

when Bombay, Calcutta, Delhi and Agra, are connected with each other, and with Madras and all Southern India, by the magnificent railways which are already in progress?" To those on the scene spoken of this might be taken for the language of irony, as applied to Madras at least. Not a sod has yet been turned in the construction of a railway, nor is even the line to be taken determined on: and as to the existing communications of the country, they are in a condition worse than those of England in the time of Charles the Second. If any one will attempt to image to himself what the social state of England would be if her magnificent railways, canals, bridges and roads were annihilated, and her communications brought back to their condition two centuries ago, he will obtain some idea of the impediments now opposed to the prosperity and advancement of this country, and which the Government only can remove.

It is to be hoped that a period of improvement is now at hand.

But we trust that now at last the commencement of a new era is at hand: the sanction of the project of an electric telegraphic communication throughout India encourages this hope. We cannot believe that with an electric telegraph established, the roads of the country will be left in their present condition. It seems incredible that things so incongruous should co-exist in the same country; that a message should be sent with the speed of light, while the ordinary mail travels five miles an hour, and that uncertainly; that the Government should be able to send an order a thousand miles in a second of time, while it could not march a regiment ten miles along a main road, without risk of its being stopped by an unbridged nullah; that a merchant at Madras should receive a reply in a few minutes, to a communication sent to Calcutta or Bombay, but should be unable to order down a cart load of sugar from Palmanair, with any certainty as to the time of its arrival, or even as to its safety. It is fair to conclude, that the same large and liberal conceptions which gave the one improvement will not long withhold the other.

The want of Engineer Officers.

705. And in order to the prosecution of both species of undertaking, works of irrigation as well as of communication, a large increase in the engineering establishments is absolutely necessary. Even now, with the present very meagre scale of work, operations are much hampered by the want of engineers. We have recently received a letter from Mr. Forbes, the Collector of Cuddapah, which places the inconvenience of the paucity of Engineer Officers in a striking point of view. We have mentioned how entirely the internal communications of that fine district have been neglected; within a short period several grants have been made for their amendment, but now these are actually inoperative from the want of officers to act upon them. Mr. Forbes enumerates no less than four works thus arrested. Two of these are for the improvement of portions of the road from Cuddapah to Madras, on estimates to the amount of *Rs.* 27,000; the two others are the tracing of passes through mountain ranges, one of them is across the Nullah Malay hills, spoken of above as so often applied for in vain by the authorities of the Kurnool district, the other is a pass from the Cuddapah district into that of Nellore. All these four important works in that much neglected district are now at a standstill from the mere want of officers to carry them on.

This partly the reason of the absence of improvements.

706. And we believe that to the same cause is partly owing the small extent of works undertaken throughout the country; for without Engineers, projects cannot be investigated, or the necessary preliminary surveys and inquiries made, nor can even the necessity of an improvement be made known, or the existence of the evil to be remedied. It seems probable that the striking contrast observable in the condition of the West and of the East Coast with regard to the means of access into the interior, is greatly due to the fact, that on the former there have been officers with leisure to attend to the roads, while on the latter there have not. In Canara and Malabar there are no works of irrigation, and the Engineers there have had time to give attention to the roads. In all the districts on the East Coast, on the contrary, except the two most northerly districts, the number of Engineers has always been far too small even for properly attending to the irrigation works; and in Ganjam and Vizagapatam, there has never been even one Engineer Officer till recently.

Remarks on the scale of establishment proposed.

707. We will now offer a few general remarks in reference to the scale of establishment which we have proposed above. We are well aware that the amount will at first sight be thought excessive. But we have not formed our opinions on this important part of our duty without long and anxious deliberation; and as we are conscious that our propositions far exceed anything heretofore contemplated or thought

thought of by the Government, we will now give some further reasons, in addition to the considerations above set forth, in vindication of our proposals.

Extent of territory and amount of population.

And first we would earnestly call attention to the vast magnitude of the work to be accomplished; unless this is fully realized, the proposed establishment, seen by itself, must inevitably appear enormous. Let it be remembered then that the Madras Presidency contains above 138,000 square miles; besides the Mysore country, with an area of 28,000 square miles, which is also administered by officers of the Madras service, and which must be included in all arrangements for the future; the whole extent of country being thus 165,000 square miles. As to the population of this extensive territory: that of the Honourable Company's own provinces amounts, by the census completed last year, to 22,281,572 persons; and adding only 3,000,000 for Mysore, we have a total population of 25,000,000 and a quarter. The country then for whose improvement we have to provide is, within a trifle, three times as large as England and Wales, and contains a population considerably more than one-third larger.*

The works to be done by means of the establishment.

708. And the work to be done in this vast territory and for this large population, is, first, though of insignificant account in comparison with the other two, to preserve the numerous Government buildings in all parts of the country, the aggregate value of which considerably exceeds a million and a half sterling, and to add to their number from time to time as may be required; second, to maintain and manage and keep in efficient repair the numberless works of irrigation, on which are dependent a revenue of *Rs.* 150,00,000 annually, and private income to the annual value of probably two millions and a quarter sterling; and not only to maintain the existing works, but to extend them, by taking advantage of the many openings for turning to beneficial account the volumes of water now annually wasted; and third, not simply to maintain, but to create a system of internal communications commensurate with the wants of 25,000,000 of people, and such as is absolutely necessary to enable them to advance in wealth and civilization; we may indeed say, to enable the products of this country to retain even their present dubious position among those of other countries of the globe.

What the state of the internal communications now is throughout the country, we have described already; and they have to be gradually brought up from this abject state into a condition more befitting the claims of the nation holding rule in this country, to civilization. And it must not be forgotten that under the centralizing system which has ever prevailed in India, and more emphatically in the Madras Presidency, the whole staff necessary for directing the execution of this great work must appear on the Government establishment. There are here no local or corporate bodies to divide the work with the supreme power. We have no turnpike trusts, no canal or railway companies. All must be done by the central power; who indeed in their capacity as sole landlord of almost the whole of the soil, stand in the position of that body which in every country not yet possessed of much commercial wealth, has the greatest interest in the formation of roads, and commands the largest funds for the purpose.

Proportion of the cost of the proposed establishments to the value of the property to be cared for.

709. Such is the task to be performed; a great work undoubtedly, one which in its most important parts has been too long staved off, but respecting the importance of which, we trust, a juster appreciation prevails now in the places of power than at any former period. But, large as it is, there is too much vagueness in the idea when presented in this general view, and we will therefore endeavour to ascertain the value of the property and of the interests to be preserved and fostered, and to bring that into comparison with the cost of the establishment proposed for the purpose. As a preliminary, we must estimate the proportion of the whole cost of establishment due to each of the three branches of work above enumerated. And it will probably not be very far from the truth, if we assume one-eighth of the whole to be due to buildings, one-half to irrigation works, and three-eighths to roads. That is to say, the annual cost of the proposed establishment for buildings is *Rs.* 1,84,000; that for irrigation works is *Rs.* 7,35,000; and that for roads and other communications is *Rs.* 5,50,000.

710. Now

* M'Culloch's "Statistical Account," (3d Edition, Vol. I. p. 6), gives the area of England and Wales as 57,812 square miles; the population by the census of 1851 is 17,922,768, or a trifle under 18,000,000.

The Government buildings.

710. Now as to the value of the property concerned; and first, that of the buildings. The dead stock account systematically kept by the Military Board, of all works under their control, affords the best information as to the value of those works, and we find it to amount to 112 lacs of rupees. As to other buildings, viz., those under the Board of Revenue in the Department of Public Works, we have not such accurate information, because the annual returns of those buildings do not show their money value. But in the Accountant-general's Office we have accounts of the actual cost of construction of all buildings, both in the Military and in the Civil Department; and it will give a near approximation to the truth, if we take for the present value of the civil buildings, a sum bearing the same proportion to their first cost, as the present value of the military buildings according to the dead stock accounts of the Military Board, bears to the first cost of those buildings. Now the first cost of the buildings under the Military Board (omitting the Saugor Division, of which the Military Board have not the accounts of the first cost,) amounted to 199 lacs, and the present computed value of the same buildings is 97 lacs; the first cost of the civil buildings was very nearly 102 lacs, and their present value, after allowing for depreciation at the same rate as for the military buildings, will be nearly 50 lacs. To these two sums must be added the value of civil and political buildings in Mysore, and at Hyderabad and Kamptee, which are under the professional charge of the Superintending Engineers of those divisions respectively, but without the control of the authorities of their own Presidency. The value of these may be taken at fully 15 lacs, bringing up the whole value of the buildings to be professionally cared for to 167 lacs of rupees; upon which the proposed cost of the annual establishment is no more than $1\frac{1}{10}$ per cent.

The irrigation works.

711. Next as to irrigation works. For these we have no specific valuation, but we can without difficulty arrive at one quite sufficiently correct for our purposes. The annual revenue derived to Government from irrigated land amounts to 135 lacs; besides Government revenue alienated to various classes in the form of enam or rent-free holdings, and which may be estimated at 15 lacs more. This makes a total of *Rs.* 150,00,000 of annual revenue dependent on the works of irrigation; and taking the proportion which we have already stated between the revenue and the gross produce, viz., taking the revenue as equivalent to two-fifths of the whole crop (which is certainly a full valuation), the total annual value of the whole gross produce of irrigated land will be 375 lacs of rupees, or $3\frac{3}{4}$ millions sterling.

Their value.

Again, to take the value of the works themselves; we have repeatedly stated that a vast amount of capital might now be invested in every district in the construction of works of irrigation which would yield a return of from 25 or 30 to 50 or 60 per cent. on the outlay; but all who are acquainted with the existing works formed by the Native Governments know that many of them yield a far smaller ratio of profit. The reasons for this difference are various; many of the works were placed in very badly selected positions, frequently from want of engineering skill and judgment in the projector, though sometimes in consequence of the limited extent of the dominions of the petty chief undertaking the work; and again from the want of constructive skill, the cost of the work was often far larger than it need have been. Another cause is, that the works now irrigate far less land than they once did, and than they might at comparatively small cost be made to do again; because the care and the preservation both of the works themselves and of their sources of supply, have been too much neglected by the British Government. On all these considerations, we think that 10 per cent. may be taken as the annual return in revenue yielded by the existing works, on their original cost; and on this basis, the value of the work is 1,500 lacs, or 15,000,000 sterling.

Per-centage of the cost of establishment.

712. We find then that the annual cost of the proposed establishments for the custody and maintenance of the irrigation works, being *Rs.* 7,35,000, is less than two per cent. on the annual income derived from them, and under one half per cent. upon their estimated capital value. It surely cannot be considered extravagant to propose so trifling a charge for the maintenance of these valuable works. But to state the case in this way only, by no means does justice to it; for our proposed establishment is drawn up with a view not only to the efficient maintenance of the existing works, but to that extension and improvement of them, and to that formation of new and most remunerating works, which in the earlier part of

of this report we have urged as so desirable. Indeed it may safely be said that the establishment for irrigation works will not be at all a charge, but a source of gain; for the revenue obtained from the improvement effected both in the economical execution of work, and in the efficiency of the works themselves, will pay the whole cost of that establishment, besides a large per-centage of profit on the direct outlay.

The road establishments compared with the gain from good roads.

713. With respect to the value of the property which will be under the charge of the Road Establishments, if we take the money value of the works of communication now existing, it will be found to be extremely small; simply because the vast importance of roads has been hitherto so lamentably overlooked by our Government. But we earnestly trust that the time has at last come, when their value is more justly appreciated; when the vast benefits which they have conferred on other countries is more generally recognized, and it is seen that the like advantages, similar advance in wealth and civilization, will follow their introduction in this country also; and our proposed establishment, therefore, is planned on a scale sufficient for the gradual formation of a system of good roads and canals on the main lines. In a former part of this Report (para. 470) we attempted to estimate the gain from such a system of communications as we advocate, when fully in operation; and we found it to amount to 960 lacs of rupees yearly, (clear of the cost of maintenance,) in the saving of the expense of conveyance. Comparing the amount of our proposed establishment for the roads with this yearly profit from the works to be effected by their means, we find that its whole yearly cost is less than $\frac{3}{5}$ per cent. upon such annual value. And in thus speaking of the value of cheap and rapid means of transport, we cannot but add our opinion that compared with this, even the maintenance and extension of irrigation is of secondary importance. Irrigation, like machinery, multiplies the produce of the soil and of labour, and provides a fund for the employment of labour on other objects besides the production of food, and so it tends to soften and humanize the character; but its influence can only be felt in a limited degree without good roads. While the latter, though they do not directly increase the produce of food or of commodities, yet give to industry and materials a higher exchangeable value, call out the peculiar resources of all localities, spread civilization and improvement into deserts, and by cheapening production, give all classes a larger command of food, as well as of all other commodities of necessity or convenience.

Cost of superintendence in England.

714. Whether then we look at the extent and populousness of the country for which we are to provide, at the vast magnitude of the work to be done, or at the pecuniary value of the property concerned, the cost of the establishments which we now propose ceases to appear in any degree exorbitant. But perhaps this will appear more clearly if we show it in comparison with the charge for superintendence in other places. We must again express regret that we have not the means of comparing it with the corresponding cost in England; a country in which the minute division of labour, and the art of economizing it by employing its various species in the most judicious and profitable manner, has been carried further than in any other. The little which we do know of the modes of doing work there, satisfy us that actual experience has there led plain, practical, economical men to adopt, and to consider necessary a much larger proportion of what is called superintendence than we have provided for in our scheme; and this, notwithstanding the causes above enumerated (para. 500), which render more superintendence necessary in this country than in England, and which also make the money ratio of superintendence to work, larger here than there. But we have not the means of making the comparison, and we therefore turn to the experience of a country of which we know more, and which more resembles that with which we ourselves have to deal; we mean the Presidency of Bengal.

Comparison with Bengal.

715. We were anxious to obtain a view of the whole expenditure in Public Works in Bengal for a series of years, and of the whole charge for establishments and superintendence, for the purpose of making the comparison for the whole Presidency; but we failed to obtain the necessary materials. But in support of our recommendation of increased superintendence on works in this Presidency, especially on those of irrigation, we are anxious to call attention to one fact of Bengal experience; viz., to the large amount of superintendence which has been accumulated on the irrigation canals in Upper India. These are works which have obtained a special share of the attention and care of the Governments of the N. W. Provinces and of India, on account of their great public utility; able officers have been carefully selected for their superintendence and manage-

The canals in North India.

ment, and means have steadily and consistently been adopted for securing efficiency in their management. Now we wish to attract special attention to the fact, that in the case of these works, respecting which the Supreme Government, the Agra Government, and the able Engineers in charge of them, have for so many years been willing and anxious to do what should best increase their efficiency, the measures adopted in order to obtain that end, have been precisely the same as those which the ablest Engineers here, as well as the Board of Revenue, have for so many years been endeavouring in vain to press on the attention of our Government in the case of the irrigation works of this Presidency; that is, a really efficient establishment has been constituted for them.

Cost of the establishment upon them.

716. On referring to the published documents respecting the Western Jumna Canal, and the Dooab Canal, we find the following facts as respects the cost of superintendence upon them. The restoration of the ancient canals, now called the Western Jumna Canals, was commenced in 1820; but the work appears not to have been completed till about 1835. During the last 10 years preceding the time of Major Baker's General Report, viz., from 1837–38 to 1846–47, the average annual cost of maintaining the works, including both improvements and ordinary repairs, was *Rs.* 66,687. The average annual cost of the establishments of the canal during the same period was *Rs.* 60,306; but from this is to be deducted the cost of the establishment maintained for collecting the revenue of the canal, and that cost, as nearly as we can compute it, from the rather scanty details given by Major Baker, was 24,242, or about 8½ per cent. on the collections. This amount being deducted from 60,306, the whole cost of the establishment, leaves *Rs.* 38,064 as the cost of that portion maintained exclusively for the conservation and repair of the canal and works; being 57 per cent. on the annual amount expended on the works. Again, to take the Dooab Canal; on the average of the 10 years, 1835–36 to 1844–45 (the last 10 given in Colonel Cautley's Report), the yearly cost of improvements and ordinary repairs was *Rs.* 71,783, and that of the establishment was *Rs.* 33,640. It seems uncertain whether this latter includes the establishment for collecting the revenue of the canal: supposing that it is included, and that it equals 8½ per cent. on the collection, as in the case of the Western Jumna Canal, it will amount to *Rs.* 6,980; and this sum, deducted from the whole cost of the establishment, will leave *Rs.* 26,660 as that of the portion employed solely in the care of the canal, being 37 per cent. on the amount expended on the works. But if, as seems probable, the cost of collecting the revenue is not included in the establishment, but is deducted from the gross receipts, then the cost of the establishment for the custody and maintenance of the canal, will be 47 per cent. on the annual amount of work.

Efficient establishments are needed here also.

717. Large as this proportion may appear, we are very far from intending to imply that it is larger than necessary; on the contrary, we quote these two instances in support of the opinion which we have already given (paras. 502 and 507) as to the necessity and the value of superintendence both in the custody of works so exposed to damage as channels and tanks, and also in managing the distribution of the water, and preventing its waste. We have already given our reasons for absolutely denying the doctrine that a comparison of the cost of superintendence with that expended in work affords any criterion whereby to judge of the sufficiency of the former, and in the present instance, we see no reason to doubt that the cost of efficient superintendence is more than repaid by the very saving in the amount required for repairs; not to speak of the additional and vastly greater benefit of preventing waste of water, and so obtaining a much larger extent of irrigation, a much larger profit to individuals, and a much larger revenue, from the same works and the same quantity of water. Nor does this truth apply to the larger works only; it is true in degree of all works of irrigation whether tanks or channels. Now the establishments which we propose for the maintenance of the irrigation works of this Presidency (including also a provision for their large extension) amounts indeed to 70 per cent. on the present very inadequate expenditure, but only to 32½ per cent. on the larger scale of outlay that we advocate; while on the two canals on which we have now been remarking, the annual cost of Engineering Establishments is respectively 57 and 37 per cent. on the annual outlay.

Details of the establishment on the North India Canals.

718. But we will examine a little more closely (though as briefly as possible) the particulars of the conservative and executive establishments maintained on those two works, as compared with those existing for similar works in this Presidency. The Western Jumna Canal is 474½ miles in length. It is formed into nine

nine divisions, averaging 53 miles in length; and to each of these there is a European Overseer, with a native establishment of three Maistries, three Chupprassies, two Classies, and three Chokidars, in all 11 persons besides the Overseer. Over the whole there are a Superintendent and three Assistants (apparently all of them usually Commissioned Officers, though, as a special case, one was of warrant rank at the date of the report), with a large establishment of natives of various denominations and grades, to the number of 52, of whom two-thirds or 34 may be assigned to the management of the canal, and the remaining one-third to the collection of the revenue. Thus for the custody and maintenance of this canal, excluding the collection of its revenues (except that part of the time of the Superintendent, and perhaps of his three Assistants, which may be given to that object), there are four Commissioned Officers, nine Warrant or Non-commissioned Europeans, and 151 natives; in all 164 persons. Thus there are on this canal, one Commissioned Officer to every 119 miles, one Warrant or Non-commissioned Officer to every 53 miles, and one native to every three miles. Again, the Dooab Canal is 140 miles in length, with one branch apparently about 20 miles long; total 160 miles. It is divided into three parts, each superintended by a European officer. The Europeans on the canal are as follows: an Executive Engineer, an Assistant Engineer, two Overseers and two Assistant Overseers. Thus there are here, one Commissioned Officer to every 80 miles, and one Non-commissioned Officer to every 40 miles. But Colonel Cautley wrote in 1845 that this number of Non-commissioned Europeans was quite insufficient, and he strongly recommended that they should be increased from four to six. The number of the native servants employed on this canal is not stated.

Comparison with the very deficient establishments under this Presidency.

719. Now let us compare the above with the state of some of the principal canals under the Madras Presidency. The Calingaroyen and the Tadapully Channels in Coimbatore, are respectively, 52 and 44 miles in length; the Wyacondan Channel in Trichinopoly is 30 miles long, and in Tanjore there are a number of canals of large size, being, in fact, almost rivers in dimensions. Again, there is the canal from the lower Coleroon anicut to Porto Novo, which, besides supplying irrigation to hundreds of thousands of acres, is capable, if well managed, of affording a very valuable line of water carriage, 35 miles in length; and there is the Cochrane Canal from Madras to Pulicat, which, in conjunction with the Pulicat Lake, forms a navigation 60 miles in length. Now, of all these canals and of the many other valuable and productive channels and tanks of large size, there is not one work, or even any one set of such works, which enjoys the peculiar care and attention of a European officer of any grade. The utmost amount of professional or skilled superintendence enjoyed by any of these important works consists of the hundredth or the five hundredth part of the time and attention of the Civil Engineer or his Assistant; who have also to attend to many thousands of other works, spread over an area of 16,000 or 20,000 square miles. Nor is there even any effective native agency in existence to supply this want of European superintendence. It is true that there are a few natives employed on each great work; but they are so few in number, they are so wretchedly paid, are so entirely removed from any real or efficient control, and in its absence are consequently so much in the selfish interests of influential Ryots, that it can hardly be said that they exercise any beneficial control over the works or the distribution of their water. Hence the strong contrast presented by the exact, orderly and systematic arrangements of the canals of Upper India, and the careful distribution of their water, with the loose, irregular, capricious management of our great channels, some villages drawing off and wasting a vast deal more water than they can use, while others receive far less than they require and are entitled to, and this without the possibility of effective redress.

The income from the Madras works per mile is very much greater than from those of North India.

720. And what makes this difference of treatment the more remarkable, is, that while the channels under this Presidency need effective superintendence and management not less than those in Upper India (a want common indeed to such works, in all parts of the world), they are far more capable of bearing the charge. For while the Western Jumna Canals yield a revenue of less than *Rs.* 600 a mile, and that of the Dooab Canal very little exceeds *Rs.* 700 a mile, the revenue from many of the Madras canals of irrigation exceeds *Rs.* 5,000 a mile; and in few or none of the larger class does it fall so low as *Rs.* 1,500 a mile;* and the Cochrane

* In order to show that we have good ground for this assertion, we append a short statement, showing the length, the total revenue, and the revenue per mile of some of the longest channels in the

Cochrane Canal, though not a legitimate source of revenue at all, affords a net income of *Rs.* 30,000 a year, which would much more than provide efficient superintendence and repairs, but which, instead of being so laid out, is remorselessly swallowed up by the exchequer.

And therefore an efficient establishment would be a much lighter charge in their case.

Again, the cost of the establishment maintained on the canals in Upper India amounts to 13½ per cent. on the revenue, in those west of the Jumna, and to 26⅔ per cent. on that of the Dooab Canal. But we have already said (para. 509), that all the more considerable works under this Presidency might be placed under efficient special custody and management, at an outlay of from 2 to 3 per cent. on the revenue they produce respectively. Probably 2 per cent. would everywhere be sufficient for this object; and this added to 3½ per cent., being the general per-centage of our proposed establishment to the whole revenue from irrigation, would raise the whole apparent charge for superintendence on such works to 5½ per cent. on the present revenue, being very far below the proportion in the North India Canals. But we would by no means be understood to imply that the new charge would in reality be any addition at all to expenditure. On the contrary, we fully believe, and this is our chief ground for advocating it, that the cost of the additional establishment would be repaid many fold in the economising of water; for under the present absence of any systematic or effective control, a large proportion of the water brought at great expense into a channel, is let out again in wanton or wilful waste. The prevention of this waste would alone suffice in a vast number of instances, greatly to extend irrigation, and so secure crops now always precarious; but as it involves the increase of the ratio of the cost of establishments to that of work, it has hitherto been thought better to effect the same object by the far more costly means of bringing more water into the channel (to be similarly wasted in great part), or better still, not to attempt to effect it at all.

The income from the North India Canals as compared with their original cost.

721. Having had occasion thus to advert to the canals of Northern India we are unwilling to quit the subject without one remark on another particular connected with them, viz., the amount of revenue that they yield. These canals were originally undertaken for the purpose of irrigation only, as we learn expressly from the reports of Colonel Cautley and Major Baker. The advantages to be derived from making them available for traffic also, attracted attention subsequently; but as regards boat navigation, this object has never been attained, and appears to be unattainable without vast improvements in the canals; and the rafting of timber upon them has been carried on to a very limited extent, and seems to be diminishing. Thus we must look to irrigation alone for a return for the cost of these works.

Now, the first cost of restoring the Western Jumna Canals was about 15 lacs, omitting the cost of the small improvements made subsequently to 1835-36, and including a fair proportion of the cost of establishments down to that time. The average gross annual revenue from the canal from all sources for the 10 years above specified, is *Rs.* 2,82,740, and the net revenue, after deducting the average annual charges of collection, and repairs of the works for the same period (being 1,68,935), is only *Rs.* 1,13,805, or 7½ per cent. on the original cost.

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the southern districts; others inferior to smaller than these in point of length, yield a larger revenue per mile than any of them.

District.	Name of the Channel.	Length in Miles.	Total Revenue in Rupees.	Revenue to the Mile in Rupees.
Tanjore	Munniaur	47	187,133	4,000
	South Rajah Voykaul	33	128,458	3,878
	Oodumboyee	21	129,023	6,144
Trichinopoly	Wyacondan	30	162,772	5,426
	Iyen Voikaul	20	105,500	5,275
South Arcot	North Rajah Voikaul	27	76,420	2,830
	Vuddavaur	14½	71,602	4,939
Coimbatore	Calingaroyen	52	86,748	1,668
	Todapully	44	77,077	1,752
Tinnevelly	Cunnadien Channel	20	162,297	8,120
	Cadagan - ditto	21	60,978	2,903
	Mundoor, Upper Branch	21	131,671	6,270
	Pauliaur Channel	26	89,592	3,446

The first cost of restoring the Dooab Canal was *Rs.* 4,37,995, taking the original outlay only. During the 10 years taken for comparison in a former paragraph the average gross revenue was only *Rs.* 82,120; but as it increased considerably after the commencement of that period, we will take the last five years of it only. The average yearly collection during these five years was *Rs.* 99,849, and the annual establishments, repairs and improvements, amounted to *Rs.* 1,20,654, being materially in excess of the receipts. But we will consider all improvements as a part of the original cost, which will then amount to *Rs.* 8,81,851. The gross annual income during the last five years being, as already said, *Rs.* 99,849, the cost of establishments and of ordinary repairs is *Rs.* 69,471, leaving a net annual revenue of *Rs.* 30,378, which is less than 3½ per cent. on the capital invested in the works.

That from similar undertakings here is very much greater.

722. We learn from Major Colvin's Memoir on these canals, in the Appendix to Major Baker's Report, that in authorizing their construction the Government did not seek "to form a productive source of revenue," but that they looked for the reimbursement of the outlay to the general improvement of the country and its resources; and, therefore, though the direct return in one of these two cases is one-third less than the interest payable by Government on money borrowed, it cannot be said that the object of the works has not been attained. But we would ask, if the policy here indicated is wise and right in the north of India, why is it not equally so in the south? The new works of irrigation constructed in this Presidency have yielded 20, 30, 50, 80, and even more than 100 per cent. annual return in direct revenue (*see* Appendix Z.), and there are numberless openings for other works sure to return fully as much; and yet capital to turn to account these enormous advantages is withheld by the Government. Far from looking to the general improvement of the country, as in any degree an object in entering on such works, or as a justification of expenditure on them, a sure prospect of an exorbitant profit in direct revenue is made one indispensable condition of a grant. We do not ask the Government to spend money on works not likely fully to repay the interest of the capital in direct return, because numberless works remain to be executed, which would return vastly more. But we do seek to awaken them to the importance of taking advantage of those opportunities; and we do plead for the adoption of the liberal and enlightened policy of the north of India, so far as to regard the increase of wealth and comfort to the people, as in some degree an end to be consulted by the Government. On such principles the improvement of irrigation would be extensively undertaken, a moderate assessment would be imposed on the land benefited, and the increase of revenue thus obtained, would be devoted gradually to the reduction of the heavy taxation which now presses on industry and checks cultivation and improvement in so many parts of the country.

Conclusion.

723. The various matters which were generally to engage our inquiries were enumerated in the order of Government of the 21st March 1851, and the memorandum from the Chief Secretary of the 22d idem, both of which will be found in Appendix (A.); and some other matters were from time to time sent down by Government for our consideration and report, in the several orders of the 10th and 24th April, 8th and 30th May, and 14th and 17th June, of the same year. In the foregoing Report we have gone over all the subjects thus placed before us, with the exception of those connected with the accounts and correspondence, and the employment of convicts on Public Works. As respects the former of these topics, the accounts and correspondence of the department will form the subject of a second Report, agreeably to the arrangement signified by us to the Government on the 12th May 1852, and approved by them; that Report is already in a state of forwardness, and we hope to be able to submit it at an early period. With regard to the employment of convicts on Public Works as a means of saving expenditure, we will here offer a few brief remarks.

The employment of Convicts on Public Works.

724. The practice of employing convicts in detached gangs under the Public Works Department, was abrogated under this Presidency in accordance with orders from the Indian Government, based on the fact that such employment of the same class in Bengal had been very unhealthy. That experience does not appear to have been supported by the results here; but taking a practical view of the matter, we are of opinion that the subject is of little importance as regards the economical execution of work, because the whole assistance that could be so obtained would be insignificant.

The amount of such labour available is too small to be of importance.

The returns for the first half of the current year give the entire number of convicts under sentence of labour throughout the districts of this Presidency, as 5,705 in 24 Zillah gaols and 15 dependent gaols. Of this number 3,215 were employed on the public roads and streets; 781 were in hospital, attending on the sick, cooking, or cleaning the gaol, &c.; 451 were employed inside the gaol, some on work that could not be dispensed with; and 1,258 were employed outside, on work other than the roads and streets, but some of it unavoidable. On the whole, judging from the actual number and distribution of the convicts, and remembering the rules which restrict the employment of certain classes of convicts to labour within the gaol, we think that no more than 2,000 at the most could be made permanently available for employment under the Public Works Department, without very much neglecting the station roads and streets. Now there seems good reason to believe that with the very short day's work of convicts, the incumbrance of their irons, and their habitual listless style of labouring, a given number of them do not do more work in a day, at the outside, than half the number of free labourers; and at this rate the labour of 1,800 convicts (10 per cent. of the 2,000 being deducted as in hospital, cooking, &c.) would be equal to that of 900 paid labourers. The value of the work of these latter at two annas a day for 300 days, would be *Rs.* 33,750; and this then would be the measure of all the aid that the Public Works Department could receive from convict labour in a year. But against this is to be set the extra cost of lodging and guarding convicts in temporary gaols, over and above what it would be in the permanent buildings, besides that of marching them long distances backwards and forwards to and from their own zillahs, for exchange, release, &c. All this would further reduce the net value of the work obtained, and it would become so trifling in comparison with the whole amount of work to be done in the Public Works Department, as not to deserve serious consideration.

Suggestions as to the management of convicts when employed on Public Works.

725. As respects that department, then, we regard the question of the employment of convict labour as one of no importance. And we cannot but think that it is one much more appertaining to the subject of prison discipline, and to be dealt with on other considerations than those with which the Public Works Department has to do. We will only offer two suggestions as to the mode of working convicts under that department if ever they should be so employed, as they may properly be occasionally, in the immediate vicinity of their own gaols.

Whenever it may be deemed expedient to give to any officer executing work the aid of convict labour, we are of opinion that the party ought, nevertheless, to remain under the charge of the judicial or magistrate department, and that the executive officer should have nothing to do with them beyond directing their labour. We also deem it of much importance, that in every such case the work done by the convicts should be accurately valued and paid for in cash by the executive officer, like any other work; the amount being received by the officer in charge of the gaol or party, and credited to Government in his accounts, under the proper head. It is usual at present in the annual statements, to show a value for the labour of the convicts; but the value so set down is merely nominal and fictitious, and is no true criterion of what has been done. In place of this we would have a real *bonâ fide* valuation, the work done by the convicts being appraised at the same rates as that done by free labour, and paid for in cash. There will be several advantages in this plan. It will ascertain accurately the real value of the convicts' labour; it will simplify the accounts of the work, and it will exhibit its real cost, instead of an arbitrary sum being deducted from the estimate or added to the bill, as the assumed value of convict labour. We cannot but think that if the assistance received from convict labour on public works had always been thus valued, and, in particular, if it had been customary to balance the value of work done by gangs stationed in temporary gaols against the extra cost of so employing them, it would not be deemed a matter of much moment whether they were permitted to be so worked or not.

(signed) *J. D. Bourdillon.*
F. C. Cotton, Major.
G. Balfour, Major.

Madras, 23 December 1852.

APPENDIX.

APPENDIX.

Appendix (A.)

Appendix (A.)

Public Works Department.

No. 57.

EXTRACT from the MINUTES of CONSULTATION, under date the 17th February 1851.

Read the following Papers.

From the Officiating Secretary to the Government of India.

(Here enter 21st December 1850, No. 583.)

* * * * * *

Para. 1. UNDER the instructions of the Government of India, communicated in Major Wyllie's letter, dated 21st December 1850, the Right honourable the Governor in Council is pleased to appoint the following gentlemen Members of a Commission for inquiring into and reporting upon the system of Public Works at this Presidency.

J. D. Bourdillon, Esq., Collector of the Northern Division of Arcot.
Major F. C. Cotton, Civil Engineer of the Seventh Division.
Major G. Balfour, Member of the Military Board.

2. These officers will, in communication with each other, fix on an early day for commencing the business of the Commission, at such place at the Presidency as may be convenient to all parties; and while so employed, will be permitted to receive the full allowances of their respective appointments.

3. Application will be made to the Government of Bengal for a copy of the Instructions issued to the Commission at that Presidency, which, when received, will be duly communicated to the Commission now appointed. Meanwhile, however, a copy of the Honourable Court's Despatch received with Major Wyllie's letter, together with all the correspondence relating to the Department of Public Works of the Madras Presidency, which is therein referred to, as well as any other papers on the records of Government, will be held at the disposal of the Commission whenever they may call for them, and the Commission will further be empowered to call on all departments and individual officers for whatever information they may require connected with the subject of their investigations; and orders will be issued to all such departments for immediate compliance with such applications, in supersession to all other calls for the time being which do not indispensably require their attention.

Military Board.
Chief Engineer.
Superintending Engineers.
Board of Revenue
D. P. W.
All Collectors.
Civil Engineers.
Superintendent of Roads.
Accountant-general.
Military Auditor-general, and
Civil Auditor.

(A true extract.)

H. C. Montgomery,
Chief Secretary.

MEMORANDUM from the Chief Secretary to the Government of Fort St. George to the Public Works Commissioners.

Para. 1. The points to which it seems the especial attention of the Commission should be directed, are,—

1st. The consideration of the Department of Public Works as a whole, whether for Civil purposes, such as—

Tank repairs - - - - -	Under the Board of Revenue.
Revenue, judicial, and public buildings	
District roads - - - - -	
Trunk roads - - - - -	Under Captain Best, Superintendent.

For Military purposes, such as—

Fortifications - - - - -	Under the Military Board.
Military roads - - - - -	
Buildings in military cantonments and at the Presidency - - - -	

2d. The working of the Executive Branch, that is,—

By the Collectors and Engineers in the provinces.
By the Superintendent of Roads.
By the officers employed by the Military Board.

Appendix (A.)

3d. The establishment which constitutes the Executive in the three divisions of the department, such as,—

Surveyors.
Overseers from the Sappers and Miners.
Collector's Maistry and District Establishments.
Civil Engineer's Working Establishments.

4th. The sums laid out annually in the repair and construction of public works, and the proportion which the expense of superintendence bears towards them, taken under separate heads for a series of years, say 15, with the view of ascertaining whether the cost of superintendence has not greatly increased in particular branches of the Maramut, while the disbursements for repairs have continued stationary.

5th. The system of control and check on the public expenditure in the provinces, including the system of accounts.

6th. The system of control and check as exercised by the Revenue and Military Boards and by the Superintendent of Roads; the means at their command for the purpose.

2. For the investigation of these points, it seems necessary that the Committee should refer to the—

1st. Correspondence which took place on the constitution of the office of Inspector-general of Civil Estimates. The number of Civil Engineers, and the limits of their range, prior to 1837. Abolition of the office of Superintending Engineer in certain divisions; increase in the number and new allotment of the Civil Engineers' divisions; constitution of a Board in the Department of Public Works, with a seat to the Chief Engineer in it; alteration of the designation of the Inspector-general to Secretary to the Board in the department of Public Works. The new territorial distribution of the Civil Engineer's divisions, and the formation of Vizagapatam and Ganjam into a subdivision.

2d. The representations of the Military Board on the constitution of the Department of Public Works.

3d. The correspondence between the Government and the Honourable Court of Directors, and with the Government of India, embracing various propositions for improving the efficiency of the Department of Public Works.

4th. Correspondence relating to the Survey School, and the employment of Overseers from the corps of Sappers.

5th. Returns obtained from the Board of Revenue of expenditure and charges of superintendence.

6th. System of keeping accounts.

7th. Correspondence with Board of Revenue regarding defects in the existing system.

3. As the correspondence on the subjects adverted to above has for the most part taken place with the Board of Revenue, their records will afford ready means of supplying the Commission with information; all others, such as the correspondence with the Court of Directors, will be furnished from the Government Office, and, on application, the Military Board will supply all papers appertaining to their department.

Fort St. George,
22 March 1851.

H. C. Montgomery,
Chief Secretary.

To the Commission for inquiring into and Reporting upon the System of Public Works.

Public Works Department.

No. 109.

Extract from the Minutes of Consultation, under date the 21st March 1851.

Read the following letter from the Officiating Secretary to the Government of India.

(Here enter 28th February 1851, No. 838.)

Referring to para. 3 of the Extract from the Minutes of Consultation, dated 17th February 1851, No. 57, and to the despatch of the Honourable the Court of Directors therein referred to, a copy of which was furnished to the Commission appointed to inquire into the system of public works at this Presidency, the Right honourable the Governor in Council deems it necessary, in addition to the duty of the Commission, which is so clearly indicated in that despatch, to instruct the Commission generally to inquire into every* branch of the existing system

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* The establishment of the Office of the Inspector-general of Civil Estimates in 1819, the alteration of system in 1836, by which the Chief Engineer had a seat in the Board in the Maramut Department, and the office of Inspector-general merged into that of Secretary to the Board of Revenue Department of Public Works.

The changes since 1836 in the territorial allotment of the Civil Engineers' ranges, the abolition of the Office of Superintending Engineers, the representations of the Military Board on the subject.

The

system of public works, both in respect of superintendence and execution; commencing from the period the office of Inspector-general of Civil Estimates was established. Appendix (A.)

The Commission will report the result of their inquiries, and submit for the consideration of Government any suggestions which they may think it expedient to make, either for the modification and amendment of the present system, or for the establishment of some other plan, whereby the execution of public works may be placed under such a system as shall insure their being planned and executed with the utmost practicable amount of promptitude, skill, and true economy.

The Commission are authorized to require the presence of any persons in the service of Government whom they may be desirous of examining on any point connected with the subject under inquiry.

(A true Extract.)

H. C. Montgomery,
Chief Secretary.

To the Commission for Inquiring into and Reporting upon the system of Public Works.

Appendix (B.)

REPORT to the Board of Revenue on the Subject of the Irrigation Department, by Captain *A. Cotton.*

To the Secretary to the Board of Revenue, in the Department of Public Works.

Sir, 13 December 1837.

1. In reply to your letter on the subject of the Tank Department, I have the honour now to offer the following as the results of what experience I have had in the matter. I propose confining myself chiefly to the consideration of the amount of expenditure necessary to keep up the irrigation works, and not to enter upon the details of the application of that sum minutely; first, because I concur with the Civil Engineer of the Third Division in the views he holds on that subject, and which he has laid before the Board; and, secondly, because the amount of expenditure required, has, so far as I am aware, never yet been thoroughly examined and determined upon sound grounds. This is a very remarkable circumstance, for it is the fundamental question; and till it is really answered with some correctness, all attempts to make the department efficient by a careful arrangement of the details, must inevitably fail; there will be either a wasteful expenditure, or an inadequate one. Appendix (B.)

2. This question has been under my consideration for many years, and I have long been anxious to see it most thoroughly examined, being fully satisfied that in the management of the Carnatic, its irrigation, if not the very first point to be attended to, is at least one of the first-rate importance; and I must say that after being about nine years employed in this line, I can come to no other conclusion than that the importance of the subject has been throughout altogether misapprehended. Since some time before my arrival in the country, it has indeed been pretty regularly advancing in the degree of attention which it has received; but after all, I have no hesitation in saying, that I feel assured that it is a subject which requires a much more systematic arrangement than it has ever yet been deemed worthy of. I am sorry that I have not had more experience in the department, and that I am not able to treat the subject as it ought to be treated, but perhaps what I can say, being the result of some years' experience, and of my having taken a real interest in the country, may be considered worthy of some attention.

3. The fundamental questions in this inquiry I consider to be these:—

1st. What is the value of the works that belong to the Tank Department, that is, not only the first cost, but also their annual value to the country, if in good order?

2d. What amount is absolutely necessary to keep them in an efficient state?

3d. What amount may be advantageously expended in new works, or improving old ones?

Out of the first of these questions arises the following: Has the actual expenditure hitherto been in excess, or less than the sum really required?

And out of the third:—

What have been the results of the attempts at improvements already made?

4. In

The efficiency of the Board of Revenue in the Department of Public Works under the present system as controlling authority and the means of improving it. The suggestions made by the Board towards this object from time to time.

The efficiency of the Executive Branch of the Department of Public Works, including Surveyors, Overseers of the Corps of Sappers and Miners, Collectors and District Establishments.

The working of the Road Department in all its branches.

The expenditure in all branches of Maramut, separately and collectively, with the proportion the charges of superintendence bear to the expenditure.

The employment of convicts as a means of saving expenditure to the State.

Abridgment of correspondence and other minor matters which may occur on a general consideration of the subject in its different branches.

Appendix (B.)

4. In answer to the first question, it will be seen by the accompanying statement of the Nunjay revenue of the districts of the Carnatic up to Fusly 1244, that the average Nunjay Jamabundy of the five years preceding that Fusly, omitting Tanjore, and adding three lacs for Chingleput, which has been omitted in the statement, was about 85 lacs; the total land revenue nearly 190 lacs; and the total of collections, including extra sources, 242 lacs. That is, the Nunjay revenue was more than two-fifths of the total land revenue, and about one-third of the total collections.

5. The statements do not contain a separate account of the Nunjay revenue of Tanjore, but the revenue of the dry lands of that district is very small, and the total Nunjay revenue of the Carnatic, including Tanjore, for the average of the years above mentioned, was about 118 lacs; that of the total land revenue, 226 lacs; and the grand total collections 288 lacs; or the Nunjay revenue was more than half of the total land revenue, and about two-fifths of the total collections. But I must here observe, that the irrigation works in general are so far from being in good order, that the revenue actually derived from them at present, is by no means the full measure of their value. In proof of this, I give the following comparison of the Nunjay revenue of five districts for four Fuslies, beginning from 1232; and that of four Fuslies, beginning from 1241, omitting Fusly 1242, because it was a year of extraordinary failure of crops from want of rain:—

Fuslies.	North Arcot.	South Arcot.	Madura.	Tinnevelly.	Trichinopoly.	Remarks.
	Rs. *a.* *p.*	*Rs.* *a.* *p.*	*Rs.* *a.* *p.*	*Rs.* *a.* *p.*	*Rs.* *a.* *p.*	
1232	16,44,000 – –	12,41,000 – –	4,20,000 – –	12,26,000 – –	8,00,001 – –	
1233	15,12,000 – –	12,16,000 – –	3,65,000 – –	11,84,000 – –	8,10,000 – –	
1234	15,64,000 – –	12,43,000 – –	4,17,000 – –	11,25,000 – –	8,45,000 – –	
1235	14,45,000 – –	12,51,000 – –	4,41,000 – –	11,65,000 – –	8,37,000 – –	
Total	61,65,000 – –	49,51,000 – –	16,43,000 – –	47,00,000 – –	33,00,002 – –	
Average	15,41,000 – –	12,38,000 – –	4,11,000 – –	11,70,000 – –	8,25,000 – –	
1241	13,32,000 – –	10,44,000 – –	4,00,000 – –	*6,26,000 – –	7,91,000 – –	* Not taken into the average as being an extraordinary season.
1243	11,84,000 – –	10,12,000 – –	4,37,000 – –	11,23,000 – –	8,00,004 – –	
1244	12,37,000 – –	11,10,000 – –	4,62,000 – –	11,32,000 – –	8,00,003 – –	
1245	11,27,000 – –	10,20,000 – –	5,00,000 – –	10,55,000 – –	8,00,002 – –	
Total	48,80,000 – –	41,76,000 – –	17,99,000 – –	33,10,000 – –	32,00,000 – –	
Average	12,20,000 – –	10,44,000 – –	4,60,000 – –	11,00,003 – –	8,00,000 – –	

6. From this it appears that the Nunjay revenue has very greatly fallen off in some of the districts even within the last 10 years; in Arcot one-fifth, in South Arcot one-sixth, though in two of its Talooks, by attention to irrigation, it had greatly increased; and in Tinnevelly, 1-15th. In Trichinopoly it has not fallen off of late years, in my opinion, because it has been so vigilantly attended to by the present Collector, but I have no doubt that it has fallen off since it has been under the Company's management. In Madura it has rather increased of late years, chiefly, I believe, from the same cause; and in Tanjore it has increased also from the same cause, leading to its obtaining a much more liberal expenditure, and much more of the attention of the Tank Department Officers. Excepting the last, I think that in every tank district the revenue is now much below what it would be if the works were in good order, so far as I can judge from what I have seen of the multitude of tanks and channels that now only produce two-thirds, one-half, or even one-fourth of the Ayacut revenue. I should judge that (omitting Tanjore, the works of which are, in the main, in good order) the remaining districts, which now yield about 85 lacs, would yield at least 120 lacs, making, with Tanjore, 153 lacs as the annual revenue of works of irrigation under the charge of Government in this Presidency: and taking the revenue at 40 per cent. upon the crop, the annual value of the gross produce of these works is about 382 lacs. To this must be added rent free lands, probably about 8 per cent., and it makes a total of 413 lacs of property per annum, entirely dependent upon the state of the works of irrigation.

7. As to the original cost of the works, I can only judge, very rudely, that the returns in revenue to Government are, on an average 20 per cent. upon the outlay, which would make their first cost 825 lacs of rupees, allowing for the rent free lands. This is not, however, a point of much consequence.

8. The answer to the first question, then, is as follows:—

1st. The original cost of the irrigation works may be about 825 lacs of rupees.

2d. The annual value of the crop dependent upon them, if in good order, about 413 lacs.

3d. The annual revenue to Government in that case would be about 165 lacs.

4th. The present actual revenue is 118 lacs.

5th. The present total value of the annual crop dependent upon them, about 320 lacs, including the rent free lands and taking the revenue at 40 per cent. of the produce.

I will

Appendix (B.)

9. I will now consider the second question; viz., What annual sum is absolutely necessary to keep them in an efficient state? So little has this point been considered, that I know of no data whatever having been prepared at any time which would enable us directly to answer this question. I believe that if a question was asked respecting the grounds on which the present annual expenditure has been fixed, there is no person whatever who could assign any reason for it, whether drawn from the annual account of property dependent upon the works, or from the experience of past years, showing how far the sums expended had been sufficient or insufficient to prevent the revenue from falling off. No annual statement, showing the increase or diminution of Nunjay revenue, with reports showing how far that increase or diminution was owing to the state of the irrigation works, how far to the failure of rains, how far to the state of the assessment, &c., are ever prepared, so that this most important subject is never brought into a clear point of view; I can only, therefore, give my own judgment upon it, formed from a consideration of the other question mentioned as dependent upon this; viz., Has the sum actually expended been in excess of or less than the sum annually required? I have not the least doubt myself that the expenditure has been totally inadequate.

I judge, first, from the innumerable instances of works in a defective state which have come under my own observation. So generally, indeed, have I found the works in a defective state, that I believe I may say that nearly all the tanks in the country, and nearly all the channels also, excepting those of Tanjore, and the very large ones of other districts, water less lands than they once did; many only a quarter, and very great numbers from half to three-quarters, and the actual revenue derived from several districts some years ago, compared with the present, fully supports me in this opinion. By the statement above given, it appears that the Nunjay revenue of North Arcot is three lacs below what it was 10 years ago out of 15 lacs, in South Arcot 2 lacs out of 12; and in Tinnevelly, three-quarters of a lac out of 11¾. But the falling off in the Nunjay revenue has, I believe, been going on for a long series of years. I cannot obtain accounts of the Nunjay revenue for more than a few years, because there are no returns of it distinct from the other items of revenue; however, that it has been falling off of late years is the principal point that it is necessary to ascertain at present, and that this is the case in several districts is shown by the above statement. This question indeed arises—Is this deficiency owing to the defective state of the public works, or to other causes? To this I can only reply, that from what I have seen I have no doubt it is owing to that cause, and I believe that it will be generally allowed to be so by the Revenue Officers and Engineers who have been employed in the irrigated districts.

10. The two southern Talooks of South Arcot are an instance of diminished revenue, which, as it has come under my own observation, I can say with certainty is solely owing to the neglected state of the irrigation works; and as very nearly the whole of the lands of these Talooks were once actually watered, the total collection of land revenue shows very distinctly the degree of order in which the irrigation works have been kept up from the time of the Company's taking charge; but it must be observed that these Talooks are said once to have yielded four or five lacs, and I believe they would now yield that if properly taken care of.

11. The Province of Tanjore requires distinct notice, as being a remarkable exception to the general state of the Carnatic, in respect of its Nunjay revenue. In this there has been no less an increase than nearly 40 per cent. of gross produce in 30 years, as shown by the statement (C.) of the Appendix. In this it will be observed,—

1st. That there has upon the whole been a constant increase of produce.

2d. That the regularity of the produce has been increased in an extraordinary degree, insomuch that while the variations in the produce of different individual years, in the first period of five, were as great as from 100 to 57, these variations had so much decreased of late years, that in the last five the greatest variation was only from 100 to 95¼. This is perhaps the best test of all of the state and effect of the irrigation works, both because the very object of them is to obviate the effects of the irregularity of the seasons, so that the crops may not be drowned in very wet ones, or withered in very dry ones, and also because it is an effect which is most clearly to be attributed to that cause.

12. The general improvement in the state of this district has been doubtless owing to its having had a succession of very able men as Collectors, on account of its great importance; but I am sure that it is in consequence of their being really able men, that they have considered the irrigation of the district worthy of their utmost care, and they have consequently not allowed the works to get out of order, either for want of necessary expenditure, or of the attention of the officers of the Tank Department. To return to the question under consideration, in general the expenditure is allowed to be quite inadequate; some of the revenue officers indeed say that the amount of the bills is quite sufficient, if it was really and judiciously expended; but even those who are of this opinion, I believe, consider that an increase of the Inspecting Department is absolutely necessary to see that the money is not wasted.

13. I will now consider what inference can be drawn by comparing the expenditure with the value of the property to be secured, upon the general principles applicable to such works. The average expenditure of the last six years in the Tank Department, including civil

Appendix (B.)

buildings, is about *Rs.* 5,80,000, and deducting half a lac for the latter works, there will be expended upon works of irrigation annually - - - - - *Rs.* 5,30,000
Allowances of Officers, Surveyors, &c. - - - - 1,00,000

TOTAL - - - *Rs.* 6,30,000

	Rupees.
Total amount of revenue dependent upon these works at present	118,00,000
Upon which the expenses of the Tank Department are more than 5 per cent., but allowing the revenue of these works, if in good order, to be - - - - - - - - - -	165,00,000
It makes the expenses of the Tank Department to be upon that sum less than 4 per cent., and taking the total value of gross produce under these works to be at present - - -	320,00,000
The expenses of the Tank Department are upon the total annual amount of property about 2 per cent., and if the original cost of the works was - - - - - - - - - -	825,00,000
The annual expenditure is upon it less than two-thirds per cent.	

14. Upon this statement it appears to me impossible to come to any other conclusion upon general principles, than that the expenditure must be inadequate; it cannot, I think, amount to more than two-thirds per cent. upon the first cost of the works. In England, canals and such works in which water is retained, require an annual outlay of 3 or 4 per cent., or from four to six times as much as is allowed in this country. There is thus an agreement between the conclusions to be drawn from this calculation, from the diminished revenue, and the observations I have myself made, and I think I may say from the general opinion of the Revenue and Engineer Officers.

15. I could give innumerable instances of particular works which have fallen into decay from the inadequacy of the Tank Department, but I will only mention the following:—

A tract of land in the very centre of Tanjore was deprived of its water by an alteration which took place in the bed of the river that supplied it; it was several years before the Engineers could find an opportunity of properly investigating the case, the work in the division being so entirely beyond the powers of the officers to get through. At last it was taken in hand: the average loss had been to Government about *Rs.* 26,000 per annum for six years, the total loss of property not less than *Rs.* 60,000 per annum; the lands were not saleable, the Meerassidars were entirely ruined, and most of the Ryots had gone to other villages. About *Rs.* 23,000 were expended in rectifying the evil, and the lands now are fully watered, and saleable at *Rs.* 150 a vaylie or *Rs.* 30 a cawnie. In this case, therefore, there was an annual loss of property nearly three times as great as the sum required to restore the works, and in six years property to the amount of about 3½ lacs of rupees had been lost for want of an expenditure of *Rs.* 23,000, and an officer to plan and conduct the work.

16. The second is that of the southern Talooks of South Arcot, above quoted, and upon which I have so often remarked in various reports. In 1827 I was called from the other end of the division, 250 miles distant, to look at the great channel called the Vuddavaur, by which they are irrigated.

This important work had been so utterly neglected, that I found it filled up with mud to a depth of about two yards; the Talooks were almost ruined, and many of the people had emigrated. An estimate was prepared and sanctioned, but from the impossibility of Engineer Officers attending to the work as it ought to be attended to, I found, on being re-appointed to that district eight years afterwards, that only a part of the work had been executed, and the revenue had continued to fall off till in 1831 it was only *Rs.* 1,18,000; whereas it had once been *Rs.* 2,20,000 while under the Company's government, and I believe as much as four or five lacs at an earlier period. In the course of six years, by an expenditure of about 1½ lac of rupees, the revenue has been increased to *Rs.* 2,58,000 in Fusly 1246 (exclusive of the Jaghere resumed in 1241, and yielding in 1246 nearly *Rs.* 49,000), and there is every reason to expect that it will continue to advance. I have just heard that there is an estimated increase of *Rs.* 20,000 in this season over the last in one of the Talooks alone.

17. A judgment may also be formed respecting the adequacy of the present arrangement, by simply considering the extent of country and value of the property in each division, and the number of persons forming the Inspecting Department. In the Third Division the annual revenue from the works is:—

	Rs.
In Tanjore - - - - - - - - - - -	33,00,000
„ South Arcot - - - - - - - - - -	9,00,000
„ Trichinopoly - - - - - - - - - -	8,00,000
TOTAL - - -	*Rs.* 50,00,000

The total value of annual produce about 135 lacs. The total value of the works themselves perhaps about 270 lacs. The extent of country is, from north to south, 200 miles, and east to west 140 miles. For the inspection of the works spread over this surface there are at present three officers (one of whom is quite inexperienced), one experienced Surveyor, and

and one apprentice. When it is considered that the officers must generally take their office-people with them, and consequently can get very little business done if moving at more than the rate of 10 miles per day, it must be evident that only a very small part of the expenditure can be checked by the Inspecting Department, which is indeed the fact.

18. Concluding, then, that both the present expenditure upon the repairs themselves, and also the number of persons in the Inspecting Department are quite inadequate, it remains to consider what amount would be adequate. I don't know how to judge of this with any certainty, but I think if the expenditure was at once increased from two-thirds to 1½ per cent. upon the supposed value of the works, there could be no possible room for fear that the sum would be needlessly great, even were the works now generally in a fair state of repair; but as the works are so very generally in want of extensive repairs, I am satisfied that a sum double the amount of the present expenditure would be most economically laid out for some years: indeed I feel sure, that if it is desirable to bring the same extent of land under effective irrigation, as has been so at times within the last 30 years, it cannot be done with less than an annual expenditure of that sum, viz., 12 lacs of rupees, at the very least, for some years to come.

19. In urging this point, I beg the attention of the Board to the abundant returns obtained from the expenditure in Tanjore, according to the statement above given, and also those in the two southern Talooks of South Arcot. It is more than probable, that to persons who are not intimately acquainted with the state of the irrigated lands of the Carnatic, it will appear quite impossible that such enormous sums in revenue may be lost or secured by so small a proportional expenditure; but I cannot but think that, if these statements are closely examined and considered, it will be impossible to avoid the conviction that the returns from money spent in securing the irrigation, are far greater than almost any other works could yield, or than almost any persons have supposed. Nor is it in the least surprising that it should be the case; that where the present means of raising food are so wretchedly bad, that four-fifths of the population must be employed upon it, any plan that will very greatly facilitate its production should produce such apparently vast results. I know that there are still numberless works which, if put into an efficient state, would most amply repay the outlay. I would further urge an extended expenditure, not only on the ground of policy, but also of justice; the lands that are watered by Government works are bought and sold in dependence upon the faith of Government, that it will keep up a vigilant attention to those works; there are at this moment multitudes of estates that are of one-fourth or one-half the value that they once were, owing to the decayed state of the irrigation works. None but those who have been much in actual contact with the people of the Carnatic, can believe the extent of loss to which land-owners have quietly submitted from this cause. Those who have seen, as I have, miles of valuable land, which within 10 or 20 years were excellent property, actually over-run with jungle, and really unsaleable from the failure of the irrigation works, can only be astonished that violent disturbances have not followed from it. When I visited the Southern Talooks of South Arcot in 1826, and again in 1833, and also the tract above-mentioned in the very centre of Tanjore, the whole body of Merassidars came to my tent and complained bitterly of the state of ruin into which they had fallen; and there could be no possibility of doubt about the state of the case, for the fields were covered with jungle, which had been some years before valuable paddy-land, and which are now again covered with grain, and the causes were equally obvious. In one case, the main channel had literally been allowed to fill up to the extent of six feet, as above stated, so that it had only two feet of water in it when it ought to have had eight; and in the other, the bed of the river had lowered about three feet, so as to leave the lands, formerly watered by it, so much above its level, as to deprive them of their supply. In both these cases, the fault was in the total inadequacy of the Inspecting Department, and of the expenditure.

20. But besides the direct loss to Government and the country, arising from the want of a sufficient number of officers to prepare the estimates, &c., another consequence of so confined a department is, that what is done must be done without sufficient local knowledge; for no officer can ever remain so long at any one work as to enable him to form anything like a proper acquaintance with its circumstances, for want of which he is continually in danger of making serious mistakes in his plans; I can say, from my own experience, that this is constantly the case. In the instance of the Vuddavaur Channel, in South Arcot, a former Engineer officer recommended a large head sluice to be constructed, in order to prevent the Veranum Tank (which it fills) from being breached by too great a supply of water; when I visited the work first, the people earnestly begged to have it destroyed, declaring that it had done much harm, by obstructing the flow of the water. From want of a sufficient knowledge of the work in particular, and the Civil Engineer duties generally, I was quite unable to judge in the case; but it appeared to me to be advisable to remove some of the cross stones, which could do no harm, and I therefore did so. Before I could again visit the work, I was succeeded by another officer, equally inexperienced, and equally unacquainted with the localities; he, however, upon further investigation of the case, destroyed the sluice, with the exception of the wing walls. Since I have returned to the Division, I have had occasion to examine the works much more thoroughly, and have satisfied myself that the sluice was no protection to the tank at all, which is endangered, not by the water it gets from the Vuddavaur, but by the floods in the Vellaur, which come into the tank from another direction; so that the tank was burst in 10 or 12 places in 1827, while the sluice was still in good order: and again, that as it was of no use, so neither did it do any harm, and there

Appendix (B.)

was nothing gained by destroying it. This case seems to me suited to show, that unless the officers and surveyors in the department are sufficiently numerous to secure the Divisions being under the charge of an officer who has previously had some experience, and who has also been long enough in it to obtain some considerable personal acquaintance with the individual works, it will be impossible to get the works efficiently managed.

21. As I have remarked above, it will probably be very difficult for many persons to bring themselves to believe the extent of loss that has been incurred by the grievous misapprehension of the importance of this question; I have been compelled to believe it myself by proofs which left no room for doubt. The loss by actual diminution of revenue in the two Talooks of South Arcot, in 30 years, has been certainly not less than 26 lacs of rupees; and no reason can be assigned why it ought not to have increased, under the circumstances of peace and orderly government which they have enjoyed. The revenue is said to have once been four or five lacs, and I feel assured that it ought now to be near five lacs: if they had been managed properly for 30 years, I have no doubt that the revenue would by this time have been at least 4½ lacs, and in that case the revenue of the 30 years would have been about 100 lacs instead of 56 lacs; a sum saved in the management of two Talooks sufficient to have covered one-fourth of the cost of the whole tank expenses of the Carnatic for 30 years, at the rate of expenditure allowed of late. That this is not a preposterous calculation, seems to me to be indisputably shown by the improvement of the revenue since the year 1832, as shown in the statement (Appendix B.).

22. In the year 1836, the whole cost of the lower annicut is included, but certainly not more than one-fourth of that sum should be charged to these Talooks, because by far the greater part of the benefit derived from it fell to Tanjore.* The total sum expended upon the Talooks, in six years, may therefore be reckoned at about 1½ lac; and the revenue has been increased from 118,000 to 258,000 per annum, though only a small part of the benefits that the improved state of the irrigation works will produce, has yet been realized; as it is of course only by degrees that the lands will again be brought into full cultivation.

23. In the General Statement of Revenue, Appendix (A.), the returns of the first 20 years do not correctly distinguish between the Nunjay and Poonjay revenue; but to persons acquainted with the country, the column containing the total land revenue of each year, is a sufficient proof of the astonishing diminution of the revenue from Nunjay lands. Even in the last 20 years, omitting Tanjore, the land revenue of the watered districts was, on the average of five years, terminating with—

Fusly	1214	214	lacs.
„	1219	216	„
„	1224	203	„
„	1229	215	„

since which it has regularly declined in 15 years to 189½ lacs, being a falling off in that period of 26½ lacs per annum, more than four times the whole cost of the Tank Department at present. I believe it will generally be allowed that this diminution has not by any means occurred principally, if at all, in the dry land (the fact probably is, that there has been an increase in the Poonjay cultivation generally, as there certainly has in some Talooks); but in proof that it has not, but that it is on the Nunjay land that the loss has been sustained, I will bring forward those districts in which the Nunjay revenue is stated separately: in Nellore, it is only stated for the last eight years, in which indeed it was pretty regular; in Bellary, it is stated for 13 years, in the first 11 of which it had not much declined, and in the last two it had increased, the restoration of the tanks having been most vigorously taken up by Government, and a much more liberal expenditure allowed. In Cuddapah, also, from the time it began to recover from the effect of the decennial lease till 1244, a period of 12 years, it had not very materially declined, but in those districts the tanks were in so bad a state previously, that they could scarcely decline much. In North Arcot, it has declined, in 13 years, from about 15½ lacs to about 12, or to little more than three-fourths. In South Arcot, it declined from 9,90,000 in 1234, and 10,80,000 in 1235, and 11,50,000 in 1236, to 8,70,000 in 1241, being eight years; in 1242, it was only 7,50,000, which was an extraordinary year of drought; in the two following years it improved, owing to the expenditure in the two Southern Talooks above stated. In Salem, the falling off has not been great; it may be considered as having fallen from about 8 lacs to 7½ lacs in 10 years. In Trichinopoly, it had fallen about half a lac in 13 years. In Tinnevelly, it had fallen nearly two lacs; the average of five years, terminating in 1229, having been 11,40,000, and of the same period terminating in 1244 (but omitting 1241, an extraordinary season), 9,45,000. In Madura, it was pretty regular for a period of 10 years, up to 1244. In Coimbatore, it has been quite regular; this district requires some remark: the works in it consist chiefly of noble channels of from 30 to 50 miles long, supplied by very solid annicuts across rivers filled by the south-west monsoon, and they are an excellent proof of the superiority of works constructed on a large scale; the expense of keeping them in order, according to calculations I made some years ago, is very insignificant. They afford also a strong proof of the value of irrigation

* For this reason: owing to the depth of the bed of the Colleroon, below that of the Vuddavaur, the latter was not supplied until there was a great superabundance of water in the Colleroon; and but for this annicut that superabundance must have been allowed to pass the upper annicut, and, therefore, be taken from Tanjore, so that the construction of the lower annicut actually throws that quantity into Tanjore, besides what the S. Rajah Voikal supplies from the lower annicut itself.

irrigation from the rivers supplied by the south-west monsoon. While the rest of the revenue, from want of rain and other causes, has miserably declined, and the district has suffered most severely for seven years, the Nunjay revenue has not in the least diminished.

It thus appears that in most of the districts there has been an actual and, in many, a very considerable falling off, even during the short period of which we have any returns; and as the irrigation has undoubtedly been better attended to for the last 10 years than it was 20 years ago, we cannot be mistaken in concluding that it had been declining previous to the period of the returns; and when to this is added the consideration, that almost all the districts, when they came under our charge, had been in such a state of confusion for some time, that all the public works were in a dilapidated state (and the comparison is made with their revenue while in that state), the sad effects of the neglect of the irrigation must be most palpable; for it is certain, that instead of the revenue having declined, had the tanks, &c. been put into a state of repair, it would have very greatly increased. In Appendix (D.) is a statement of the cultivation and revenue under tanks in a part of the South Arcot district, which may be taken as a specimen of the Carnatic generally.

24. The total average land revenue of five years, terminating in 1229, was 215 lacs; the average of the succeeding 15 years, up to 1244, was 197 lacs; had the revenue kept up to the former amount, there would have been collected, above what has been realized, 18 lacs per annum, or 270 lacs in 15 years. I believe the whole of this loss has been sustained in the Nunjay lands; but allowing it to be only three quarters of it, it amounts to 200 lacs. I will venture to say, that had the Tank Department been on an efficient footing, not only would this have been saved, but the revenue would have greatly increased, so that I cannot reckon the loss at less than 300 lacs in 15 years, or 20 lacs a year, which I feel equally assured would have been saved by an increase in the expenditure averaging eight lacs a year, or 120 lacs in the 15 years. The total collections of land revenue for 30 years, viz., from Fusly 1215 (about which time the districts appear to have got over the extreme state of depression they had been in during the anarchy that preceded the Company's Government) to 1244, both inclusive, were 6,222 lacs, making an average of 207 lacs per annum; the average of the five years ending Fusly 1219 (the first portion of this period), was 216 lacs, making the average of the period of 30 years nine lacs less than the average at the beginning of that period; and, as the average of the last five years was only 189½ lacs, the revenue had fallen no less than 26½ lacs per annum in 25 years.

25. I must here observe, that in taking the averages, I have omitted those seasons which were evidently extraordinary ones, such as that of Fusly 1242, which is therefore not included in the average of the last five years; had it been included, the deficiency would have appeared much greater. It seems to me, that using this precaution, the average of periods of five years affords a very fair ground for judging. I have also stated all the sums in round numbers, that the statement might be clearer, taking care however not to omit any sums of sufficient amount to affect the general conclusions.

26. In all these statements I have omitted Tanjore, because the circumstances of that district are as striking a proof of the good results of a liberal system in the management of the irrigation, as the other districts are of the opposite. I do not mean to say, indeed, that the other districts would have afforded as great a result as this does had the irrigation been equally well managed; because it is notorious that it has natural capabilities far beyond the Tank Districts; but still it is very encouraging, and to my mind proves that every district in the Carnatic would have been actually improved instead of declining in revenue, and also in prosperity, if the irrigation works had been kept in order, though not in the same proportion to the amount expended. At all events, it is not in any view possible to conceive that there can be any ground for supposing that all the other districts should have actually declined, and in a great degree, while this has been most rapidly improving, had these works been equally well attended to; nor do I think there can be the least doubt that had the Tanjore works been as much neglected as those of other districts, it would have suffered more than they have, notwithstanding all that could have been done for it in other points of management; neither do I pretend that all its improvement has arisen solely from its Collectors having been careful and judicious in their attention to the public works. I allow that a very great part of that improvement has arisen from the able management of it in other respects, or rather I should say, that it is from the two combined that its present prosperity has arisen, for good revenue management would have availed it little if the irrigation had been neglected, and but little could be effected by supplying the greatest abundance of water, where it was unaccompanied by a vigorous and lively system of revenue management, and a moderate and well regulated assessment. The following statement shows the comparative results in Tanjore, and in the other 11 irrigated districts.

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	In Tanjore.	In other 11 Districts.
Average total land revenue of five years, terminating Fusly 1214	26,20,000	2,14,10,000
Average total land revenue of five years, terminating 1244	36,00,000	1,89,50,000
Decrease in 11 districts	- - -	24,60,000
Increase in Tanjore	9,80,000	
Average total land revenue of five years, terminating Fusly 1214	26,20,000	2,14,10,000
Average total land revenue of following 30 years, terminating Fusly 1244	33,60,000	2,07,00,000
Average decline in 11 districts	- - -	7,10,000
Average increase in Tanjore	7,40,000	
Total loss in 30 years in 11 districts	- - -	2,13,10,000
Total gain in 30 years in Tanjore	222,00,000	

27. I cannot omit here to remark upon the amount of the extra sources of revenue, not that I think they affect the present question, but to show why I think they do not, lest it should be supposed that as they have increased in all the districts, it is because, some how or other, the money that used to be paid in the form of land revenue, is now derived from these things, which form the luxuries of the middling and lower classes. This merely shows a more equal distribution of property now than formerly; and it is supported by two facts, viz., the impoverished state of almost all the families that were once possessed of great property (at least in this part of the country), which is notoriously the case; and 2dly, the almost complete annihilation of the foreign trade in the Ports of Porto Novo and Nagpore, from which it appears certain that the property which was once (as it would naturally be under a weak and unprincipled Government) concentrated in the hands of a few, while the great body of the people were in abject poverty, has, under the strong and upright Government of the Company become diffused through the great body of the people, and consequently that a great portion of what once went to support foreign trade, which supplies the luxuries of the very rich, now goes to the purchase of those articles of home produce, which form the luxuries of the great body of the people. I conclude, therefore, that notwithstanding this increase in the extra revenue, there has been a real diminution of Nunjay produce, and so of revenue, to the extent stated, under 30 years of perfect peace, under a strong, orderly and upright Government, and without any one natural cause that can possibly account for it; a thing which perhaps never occurred in any age or country before. I think it will be generally allowed that there has been nothing in the revenue arrangements which can satisfactorily account for it; those parts of the country which are chiefly under native revenue management such as the zemindaries, not being included in these districts.

28. Supposing it to be considered as allowed, that the loss in revenue, from not keeping up the irrigation works has been enormous, and far beyond what the expenditure would have been to have kept them in an efficient state, I will now consider the third question, What might be expended beyond what is necessary to keep the present works in good order? and must I not add, what would probably have been done under a Native Government, had it been favoured with the prodigious advantages we have had from continued peace, and such an extent of country under one authority, as would allow of works being executed upon a noble scale, so as to include great tracts within the influence of individual works or sets of works, which would have many and great advantages over a multitude of small unconnected schemes? Had anything approaching to what might be called an energetic system of proceeding in the irrigation question been followed up, who can estimate what might have been the state of the Carnatic at this time?

29. Had a hundredth part of the time, labour and money that has been lost by droughts, or expended in trying to obviate the effects of scarcities, been expended in providing against them, very much might have been effected. It is undoubted, that in the worst year that ever occurred, enough water has been allowed to flow into the sea to have irrigated ten times as much grain as would have supplied the whole population. The Carnatic, I acknowledge, is like England and every other country, not very able to support a large population, if nothing is done to provide water when naturally it would be deficient, and to carry it off when naturally it would be in excess; but I am fully assured that there is no reason whatever why it should not be one of the most populous and fertile countries in the world, if the energies of its Government were exerted as they must be, to render any country whatever what it is capable of. The present state of Tanjore will answer for the rest of the country; the one grand difference between that and the other districts is, that it is supplied with water. It is often supposed that it has great advantages in point of soil, but this is a mistake, the great proportion of land is by no means of particularly good quality; the proof of which is, that in general, if it is not irrigated, it is not worth cultivating for dry grains; what enables it to bear its crop is the fertilizing effect of the water. There are certainly in the other districts tracts of rocky ground, but they bear a small proportion to the lands which are of a quality equal on the average to those of Tanjore. What was the state of Tanjore itself 30 years ago, as shown by the returns of gross produce? That varied in different

different years so much as to be in some nearly double what it was in others; a variation as great as, I believe, if not greater, than in any other districts; and for this reason, that if the main freshes failed, or exceeded in any considerable degree, the whole year was lost; whereas in the other districts dependent upon the local rains, they often get rain enough to secure them a crop in another part of the year, though they may have failed at the regular season. That which has now made the crop of Tanjore so much more certain than it was, is, not that there has been any change of the seasons, but only the same thing which is wanted in other districts, viz., arrangements for securing the water better in deficient seasons, and getting rid of it better in excessive ones. I have before observed that the supply of water is ample throughout the Carnatic. If there is any doubt about this, let it be observed how much water runs into the sea by the Pennar, in Nellore, the Pallaur and the Poniaur, in North Arcot, the Vellaur, the Colleroon, the Vygay, and the Tambrapoorny, not in severe freshes, but in moderate ones; undoubtedly more than enough to water the whole Carnatic. There are at this moment passing to the sea, by the Colleroon, at least 100 million cubic yards of water per day, sufficient for a crop of paddy on 8,000 cawnies; in a good fresh, sufficient water for a crop on 30,000 cawnies runs to waste daily. In a moderate season enough is lost to water certainly at least a million cawnies, or a tract double the extent of Tanjore, which would provide grain for about 2 ½ millions of people.

30. It would doubtless cost more to lead the same quantity of water through other districts, than it does to distribute it over Tanjore; but this is the only difference; and still it would most amply repay the cost of the necessary works, so far as I have been able to ascertain by inquiry. I estimate the value of water as follows: on an average, the value of the gross produce of a cawny of paddy, in one crop, may be reckoned at *Rs.* 20, the expense of cultivation at five, and the revenue at *Rs.* 10; the quantity of water required for it may be estimated at 12,000 cubic yards, and allowing a portion of this to be supplied by the local rains, a supply of 10,000 cubic yards, secured by means of artificial works, will generally be sufficient. This water, so supplied, will almost certainly secure a revenue of one rupee per 1,000 cubic yards, besides about half a rupee net profit to the landowner. To compare this calculation with actual results on a large scale, I find that Tanjore receives, in an average season, 6,600 million cubic yards of water; but this includes a considerable quantity which is not required, viz., during the high freshes, and also during the local rains, when a great proportion flows into the sea. About 5,000 millions may be actually used, the revenue from which would be, if the rent-free lands were included, about 40 lacs; this gives rather more than 1,200 cubic yards per one rupee of revenue. This is sufficiently correct for our present purpose. As for the expense at which a certain quantity of water may be brought upon the lands, I judge from the cost of works now in use, and from the general experience I have had in the irrigation, that there are yet openings for undertakings to a very great extent, by which water may be obtained at the rate of 500 cubic yards per annum, for one rupee of outlay in entirely new undertakings; and hence *Rs.* 2½ expended on new irrigation works would secure a revenue of one rupee; but as the same portion of the population if employed on Poonjay land would pay to Government, as far as I can ascertain, about two-fifths of the revenue that they would if employed on wet lands, the advantage to Government would be only three-fifths of the whole Nunjay revenue, or three-fifths rupee for *Rs.* 2½ of cost, or about one rupee per annum for four of capital expended, or 25 per cent. This result, I am well assured, is under the mark. In the case of the Colleroon annicuts, I reckon that certainly not less than 2,000 millions of cubic yards have been added to our annual supply of water for the irrigation below the Head of Seringam, in Trichinopoly, South Arcot and Tanjore, and this has been obtained at a cost of about *Rs.* 3,00,000, including a considerable sum for some small works which yet remain to be executed; this gives not much less than 7,000 cubic yards per rupee; but it is quite an extraordinary case, and the returns cannot probably be less than cent. per cent. on a series of ordinary years; not taking into calculation their effects in extraordinary seasons such as that of last year. There are however cases somewhat similar to this, where water may be obtained at a less cost than one rupee for 500 cubic yards, as above calculated; such as those in which advantage is taken of works already constructed, the usefulness of which may be increased by some additional subordinate works; as, for instance, enlarging the channels from an annicut and adding a tank, in order to store up the water of the high freshes; where this can be done, as it may in many places, the main work being already constructed, the additional ones may be completed at a smaller cost in proportion to the water to be obtained, than in an entirely new undertaking. Another case in which the effects of a certain expenditure will be greater than I have stated it, is where channel or tank irrigation has been so extended as to cause a frequent loss of the crop, as in the Ambaravutty and Noel cultivation in Coimbatore, and more or less in most other places. In those circumstances the main part of the supply for the crop is already obtained, and a small addition that can be kept in readiness is all that is required; I may therefore say, without hesitation, that there is much room yet for such additional works as would yield 50 per cent. in actual returns of revenue to Government.

31. I will now merely notice a few situations where new works may be undertaken with advantage. It is evident that the first expenditure should be made upon those rivers that contain the most constant and certain supply of water, and upon those tracts where there is already extensive cultivation, but which is not well secured in its supply of water. The Cauvery and its feeders, as being supplied by both monsoons, is of course the most important river of the Carnatic; and, secondly, the Pallaur, as passing through the next greatest extent of country. The Cauvery is also the first to be attended to, because so little has yet been

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done to it, while much small rivers, and those wholly dependent upon the more precarious supplies of the north-east monsoon, are overloaded with annicuts. There was not one in use on the Cauvery, below the Ghauts, previous to the construction of those in 1836. There is an ancient one near the Ghauts, but it is partially ruined, and it is not certain that it was ever made use of. The high freshes of this noble river are, therefore, entirely lost still, excepting that the Veranum tank, and one or two small ones, get a portion of their supply from it: for the annicuts, not having any other tanks attached to them, only secure the water of the moderate freshes.

32. The first new undertaking that I would mention is one that I examined into with some care in 1828: viz., the construction of large reservoirs in the Neilgherries and Delki Hills, for securing the cultivation of the Bawany and Ambaravutty, and assisting that of the Cauvery: I did myself the honour of reporting particularly upon this project in 1829, but the plan was not supported by the Board. I do not hesitate now to mention it again, because I trust that the time has arrived for distinguishing between those things that are merely new, and those that are in themselves really visionary. I have stated in my report that the fine basins with narrow outlets that are found on the hills, the certainty of the supply of water, and the extent of the cultivation in the low country, subject to occasional deficiency of water, offer peculiar advantages which might easily be secured. As the Board have my report, I need not enter further into the details of this plan.

33. The second undertaking that should be noticed, and which has been often partially brought to the notice of the Board, is the restoration of the Ponairy in Trichinopoly. This reservoir seems to have extended 30 miles in length, and its river channel, which was apparently 50 miles long, filled besides many smaller tanks. There seems to me to be almost every inducement to restore this reservoir; and at the same time I think the work may be so planned as to form one of the most complete undertakings that could be executed in the Carnatic. I have not yet had time to investigate the case by any means completely, but so far as my knowledge of it goes, it appears that the best plan would be to lead off a large channel from the upper annicut, carrying it on as high a level as possible, so as to take it through the middle of the Arrialore and Oodiarpollium Talooks, cultivating much land immediately from the channel, filling almost every tank in those Talooks (which are now dependent upon the local rains, and by far the greater part of which are now almost unproductive), securing a great portion of the water of the various jungle streams crossed by it, and discharging itself into the Ponairy; at its head must be a lock, and from the Ponairy to the head of the Vuddavaur in South Arcot, which is only a few miles distant, a cut should be made, with another lock, so as to complete the water communication to the Porto Novo Canal. The advantages of this undertaking would then be:—

1st. In the high freshes of the Cauvery a large body of water which at present runs to the sea would be stored up in the Ponairy and other tanks, against the time of the low freshes; that is, during July, August, and November, the water would be obtained to be used in September, October, December, January, and February.

2d. During the moderate freshes, when there is much more water than we can use for the present cultivation, a portion of it would be conveyed to a vast extent of lands, watered immediately from the channel, as well as to those under the tanks, for immediate use. Since this was proposed a canal is ordered to unite the Cauvery and Colleroon at the lower annicut, which makes this navigation complete.

3d. There would be a most complete water communication from the upper part of the Cauvery to Porto Novo, which would be navigable for about seven months in the year, and for boats drawing not more than a foot, perhaps for nine months.

4th. A portion of water during the dangerous freshes would be led off from the river, and thus what at present is worse than useless, would become very valuable. Every tank that is constructed to be filled during the high freshes is a step towards relieving the country from damage by floods. The main branch of this channel might also be carried across the Vellaur into South Arcot, conveying the water of the high freshes of July and August into innumerable tanks, at present dependent upon the north-east monsoon.

34. The use of the upper annicut would in this way be greatly extended. The two talooks of Arrialore and Oodiarpollium contain a vast extent of excellent lands for irrigation, and I am assured that the population is pressing hard upon the present cultivation. The people are most anxious for these works, and it is stated that since it has been known that they are in contemplation, many have been endeavouring to secure a right, by purchase or otherwise, to the lands likely to be watered. This is such a plan as I have long wished to see executed; all the present river channels, either from the smallness of their capacity and extent, or from their having too great a fall, merely water a narrow strip of ground near the river, but not one at present in use leads the water out fairly upon the general level of the country, so as to command a broad tract. In Coimbatore there are channels 50 miles long, but they have a fall of no less than six feet in a mile, and there are no channels from the Cauvery of more than 20 or 30 miles long. The total fall of the river from the upper annicut to that point which is opposite to the Ponairy, is about 180 feet, being 65 miles; hence, if the channel has a fall of one foot per mile, which is the fall of the Vuddavaur, it would at the end be 115 feet above the level of the river, and this, according to the information I have, is much more than the highest level of the ground in Oodiarpollium between the Cauvery and Vellaur, so that the whole of the lands of that tract might be commanded by the

the channel. These two talooks might thus be made almost as productive in proportion to their extent as Tanjore, and they would have greatly the advantage over it in respect of floods. I would strongly recommend this being immediately taken in hand, but it cannot be done properly without additional officers and surveyors, unless almost all other business of the department is stopped in the division.

35. The third work I would mention, is, to carry the waters from the lower annicut across the Vellaur, at the north end of the Veranum tank, into the Bowanygherry Talook, filling the great tanks called Wallajah and Paroomal yairy (yielding, I believe, near *Rs.* 50,000 revenue, if filled with water), and others, and terminating at Cuddalore. This is not a very extensive work, but it would, I should think, be extremely productive. The great object, of course, is to find means of storing up the water of the high freshes which the new annicuts have placed at our disposal, and wherever there is a large reservoir we should make use of it for this purpose if possible.

The Ayacut of the Paroomal yairy alone is about *Rs.* 13,000; it now only waters land yielding *Rs.* 6,000.

36. The fourth improvement, which I have good reasons to believe would be of great utility, and abundantly answer, is one that has been talked of for a great many years, but never thoroughly investigated; viz., the restoration of the Nerinjapet annicut across the Cauvery, 15 or 20 miles above Bowany, and nearly due west of Salem. This is a very old work, about 400 yards long, and though breached, a great deal of it is still standing. I have not seen it myself, but have had an account of it from several persons; I have been however also informed, by an officer of the department, that a few miles higher up there is a good situation for leading off a channel without constructing an annicut. Next to the restoration of the Ponairy, this appears to me the best part of the country in which to construct an extensive tank for securing a further portion of the high freshes of the Cauvery. A very large channel should be led off from the East bank to convey water to the first site, where an extensive tank could be constructed, and I conclude that somewhere in that neighbourhood a large valley could be found fit for the purpose. A channel, 100 yards broad, would convey about 10,000,000 cubic yards per day during the high freshes, and if the tank was 15 miles long, three broad, and 10 yards deep in the deepest part, it would contain about 500,000,000 cubic yards, and would probably be filled every season, and supply water for a complete crop on 40,000 cawnies; the value of it, however, would in effect be much greater than the revenue of that extent of land, for it would be used to complete the supply on lands already cultivated, at those times when the river was too low, and hence it would (with the supply to be received from the river during a great part of the season) secure an extent of cultivation of three or four times that amount. At present the cultivation every where is limited by the height of the water in the low freshes; thus, in a river channel which, when the river is high, conveys water enough for 10,000 cawnies, perhaps only 5,000 will be cultivated, because that is the utmost limit to which they can expect a sufficiency of water during the low freshes, so that if there is water enough for 10,000 cawnies on 60 days in the year, and only enough for 5,000 on 60 more, half the water during the 60 days is lost, and allowed to run to waste. But if there was a tank to provide only for the times of scarcity, the cultivation might immediately be extended. This is, however, besides securing the present cultivation, some of which is lost almost every year, and when the freshes are more irregular than ordinary very great remissions are made. Thus, last year there was probably one-ninth of the main crop of Tanjore lost, which, if such a tank as that now proposed had existed, would have nearly all been saved, and it would have in that one year produced about four lacs of rupees in revenue, besides greatly relieving the distress of the Southern Districts, by furnishing an additional supply of grain to the extent of perhaps 20 lacs of cullums. This would have been in Tanjore alone, besides the other Cauvery cultivation. The effect of such a work, in diminishing the danger of breaches in Tanjore, &c. would also probably be as good as if a lac of rupees was laid out on the Colleroon and Cauvery embankments. It would lower the rivers nearly a foot in a severe fresh. I think it probable that a channel from this annicut might be led on a sufficiently high level to carry water over the ridge which separates the feeders of the Vellaur from those of the Cauvery, between the latter river and Salem, in which case it might be turned into the former river and conveyed along its channel through the Ahtoor Pass, and when clear of the hills, it might be turned by an annicut into a channel which would lead north-east through the north-west parts of South Arcot, and across the Pallavaur near Conjeveram, thus carrying another supply from the Cauvery into the very heart of the Carnatic, on a higher level than those mentioned in the preceding proposals.

37. The fifth improvement I would propose, should be a more extended use of the Pallaur. That great river, in one day, sometimes pours into the sea, I should suppose, as much as 200,000,000 of cubic yards, while there are, within a few miles of its banks, lacs of cawnies of good land perfectly waste, and on the lands that are cultivated the crops are continually lost for want of water. Probably the best works for that tract of country would consist of one annicut across the Pallavaur, as far to the westward as the nature of the country would admit, that is near the mouth of the Amboor Valley, with a large Rajah Voykal leading from each end of it, and extending 50 or 60 miles to the eastward, with small channels leading to the innumerable tanks already existing there, and another annicut lower down, perhaps near Arcot, with similar main and branch channels extending quite to the coast; when all the present cultivation had thus been provided for, advantage might be taken of every suitable situation for the construction of additional reservoirs. By this means the country between the Ghauts and Madras might be incalculably improved.

I shall not here say anything of the first division, as I am only speaking from report;

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but it is well known that there are at least as fine openings for improved irrigation there as in the others.

38. I have mentioned these as instances of what might be done to make the Carnatic a fully cultivated and populated country; and I do not doubt in the least, that were these plans followed out, even the climate would be greatly altered. Extended cultivation, accompanied as it would be by extended planting, would greatly diminish the severity of the hot winds, as in North America the climate has been wonderfully improved by clearing and draining the country.

39. Before concluding this part of the subject, I must remark upon the state of the population. I have been greatly disappointed in being unable to obtain from any person, to whom I have spoken on the subject, anything like a certain opinion as to the rate at which it is increasing; all say that the returns are so inaccurate that they cannot be depended upon so much as to enable us to judge what addition there has really been in a certain number of years.

However, all seem to agree, 1st. That the returns are a tolerable approximation to the real number of people; and 2dly. That it is considerably on the increase. In the towns of Madras and Trichinopoly, it seems to be fully ascertained that the population has greatly increased; and I suppose that this certainly indicates an increase in the rural districts. If this point is allowed, the question is, how is the additional population to be provided with grain food, by means of wet or of dry cultivation? Supposing, for instance, that the population of the 12 districts is 9,000,000, and that it is increasing at the rate of one per cent. per annum, which, from what information I can obtain, seems certainly within the mark, there is an annual increase of 90,000 persons to be provided for, or within the next 11 years, 1,000,000. These would require 125,000 cawnies of Nunjay cultivation to supply them with food. Probably the quantity of Nunjay has been decreasing in about that proportion during the last 25 years. If, while the population has been increasing, the Nunjay cultivation has been decreasing, can it be a matter of surprise that every bad season causes such dreadful scarcities? Surely it is desirable at least that provision should be made for the increasing population by means of irrigated lands, otherwise their food must be supplied from Poonjay land, and must therefore be extremely uncertain. But besides increasing the Nunjay cultivation up to what it once was, and providing for the additional population in the same way, why should not every effort be made to substitute Nunjay for Poonjay? Every step that is taken towards this end, both diminishes the danger of scarcities, and greatly increases the comforts of the people; for perhaps one-half the number of persons are required to raise a certain quantity of food on wet land that are required on dry, and the remainder will of necessity be employed in manufactures. While the country is mainly dependent upon a system of cultivation so precarious that four-fifths of the whole population must be employed in raising food, it is impossible that the great body of the people can be well clothed, or supplied with other comforts. Nor can the population itself increase rapidly; there can be no doubt that the scarcities, and even famines, that are so often experienced in this Presidency, must seriously check the population. I conclude the actual number of deaths by famine, in the last 15 years, must be very great, from the accounts I have had from eye-witnesses.

40. I should on the whole recommend most earnestly that arrangements should be made, first, for the partial or complete restoration of the present works, not, however, without carefully comparing the probable results of each individual case with those of new works on a more extended scale. Where it can be done without direct injustice to individuals, it would certainly be better to construct new works on a large scale, that would yield 30 per cent., than restore old and small ones that would yield an increase 40 per cent. upon the required outlay; on account of the great advantage of having rather a few works of magnitude to watch over than a multitude of small ones. It is also very possible, that in some cases where extensive works are constructed, the cultivators under small works, still partially in a state of repair, might be induced to remove to the lands watered by the new works. I do not, however, see how the present works, however imperfect and poorly supplied, can be allowed still further to deteriorate, without some distinct and equitable arrangement being made with the Ryots.

Second. For the construction of new works, either to water new land, or to secure the supply to lands already cultivated as Nunjay.

41. For the last question, as to what encouragement we have in respect of new works, from the results of those already executed, I would refer chiefly to the reports which the Board have received respecting the Colleroon annicuts; perhaps the following statement will show still more clearly the effects of the lower annicut than my former report.

STATEMENT of Height and Quantity of WATER at the GRAND ANNICUT.

	Average of 20 Years.				Fusly 1241.				Fusly 1246.				
	Height.			Quantity.	Height.			Quantity.	Height.			Quantity.	
	C.	I.		Millions.	C.	I.		Millions.	C.	I.		Millions.	
				Cubic Yds.				*Cubic Yds.*				*Cubic Yds.*	
ne - -	2	8½	below -	150	1	4	below -	607	2	3½	below -	173	The measurements are cubits and inches above and below the crown of the Grand Annicut.
ly - -	0	1⅜	above -	1,200	0	11	ditto -	907	0	6½	above -	1,350	
ugust - -	0	9¾	ditto -	1,500	0	8	above -	1,316	0	9	ditto -	1,400	
eptember -	0	4	below -	1,100	0	3¾	below -	1,076	0	6	ditto -	1,350	
ctober - -	0	1½	ditto -	1,200	0	3¼	above -	1,233	1	13	below -	300	
ovember -	0	10½	ditto -	900	0	10	below -	852	2	2½	ditto -	173	
ecember -	1	12⅔	ditto -	300	1	4	ditto -	694	3	5¼	ditto -	13	
nuary - -	2	13	ditto -	75	2	11	ditto -	72	3	12	ditto -	3	
ebruary - -	3	8½	ditto -	3½	3	5	ditto -	14	3	17½	ditto -	2	
TOTAL of last Five Months - -				2,478½	-	-	- -	2,865	-	-	- -	491	

42. From this it appears, that in the year 1241, when the revenue was at its lowest in Munnargoody and Chellembram, the supply of water in the Cauvery for the whole year was above the average, and that the supply of 1246 (the year the annicut was built), was very greatly below the average, and nearly as low as in the worst year of which we have any records.

HEIGHT of WATER at GRAND ANNICŪT in the Four last Months of the Season of Cultivation.

	Average of 20 Years.		Fusly 1241.		Fusly 1246.		Worst of 25 Years.		
	C.	I.	C.	I.	C.	I.	C.	I.	
October - - -	0	1½	0	3¼	1	13	1	10	All below the crown of the Grand Annicut.
November - -	0	10½	0	10	2	2½	2	2	
December - - -	2	13	1	4	3	6¼	2	15	
January - - -	1	12½	2	11	3	12	3	12	
	3	37½	3	28	9	33¾	8	39	
Average of Four last Months of Crop -	1	4½	1	2¼	2	31	2	10	

43. Again, taking the averages of the four last months of the cultivating season, October, November, December and January, it appears that 1241 was above an average year, and that 1246 was so much worse than any previous season of which we have any record, that the supply in the Augunda Cauvery could not have been one-half of what it was in the worst years since 1812, being 25 years. For it must be observed, that the above heights show the quantity of water in the Cauvery at the grand annicut, which, up to 1246, was always in moderate freshes from one-third to one-half of the whole supply of the Augunda Cauvery; but in 1246, by means of the upper annicut, almost all the water was thrown into the Cauvery, and in the latter months none at all was allowed to pass that work into the Colleroon; thus, by means of the new works, the whole of the water in the Augunda Cauvery was distributed to Tanjore and Trichinopoly; and the South Arcot Talooks were so much better supplied from the drainage water of the bed of the Colleroon alone, than they had been in 1241, by more than an average supply in that river, that they produced a revenue of *Rs.* 2,58,000, while in 1241 they produced only 1,18,500, being an excess of *Rs.* 1,39,700 in these two talooks alone. When it is also considered that there was a very great failure of the rains in this part of the country last year, and that the cultivation commenced within a few months after the annicut was sanctioned, so that scarcely anything had been done to improve the distribution, I trust it will appear indisputable that the results of these works are perfectly satisfactory, and by no means below what I estimated them at in my reports; that they amount to nearly a certainty that the irrigation of these talooks will be secured in future, and that they only require to be properly attended to, and such minor works as may be necessary for the distribution and draining executed, in order to ensure after a time a revenue equal to what it is said formerly to have been, viz., 4 or 5 lacs or more, for there is yet a very great extent of land unwatered, though every part of the talook is below the level at which we can obtain water.* Again, the best year's revenue of the

* I have obtained statements of lands capable of being watered in Chellumbrum alone which would yield an additional revenue of *Rs.* 1,00,000, besides much other lands.

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the period of 30 years preceding 1244, was only 2,20,000; last year's was 2,38,000, that is in the very year that the annicut was built. Though the supply of water in the river was less than half of the worst of the preceding 25 years, the revenue exceeded that of the best year of the first 30 years of the Company's management, by *Rs.* 18,000, yet there is an estimated increase this season of *Rs.* 35,000* upon last year, making already a total of *Rs.* 53,000 above the best year of the first 30 years.

44. With respect to the results in Tanjore and Trichinopoly, I do not yet see the least reason for thinking my former view of the last year's returns incorrect, excepting that I understand the revenue exceeded that of the preceding by 2 lacs, instead of falling short of it, as stated. Thus far, I think, there can be no possibility of doubt; viz., that the whole cost of the works was much more than repaid within 15 months from the commencement of their construction; almost every month of this year has been below the average in the supply of water in the Agunda Cauvery, yet the district has been plentifully supplied with water, without any intermission of consequence from the beginning of the season up to this time, which has never been known before, I believe; and the accounts I have got from the district are most satisfactory.† These results are, I think, abundantly sufficient to afford encouragement to proceed with such works, as respects the actual returns in revenue to Government; but I believe the increase in the value of property to individuals is also at least proportionately great: in Trichinopoly, I have ascertained that the value of the lands in Seringam has actually doubled, and I am informed that the same is the case in Munnargoody and Chellumbrum; in Tanjore, also, I am assured that the price of land has greatly increased; so that when it is considered that as much as 5,60,000 cawnies of land are affected by the annicuts, the saleable price of which is perhaps 800 lacs, it does not seem too much to suppose that they have been the means of causing an increase of private property to the extent of no less a sum than 50 lacs.

45. If this has been effected with our present means, we may surely without the least doubt expect that, when after a time the divisions are in charge of men of experience and local knowledge, and something like real system is introduced into the department, such a state of things may be established, as respects irrigation and communications, as will make the Carnatic altogether different from what it now is.

46. I beg to apologize for the unreasonable length of this paper, but it is not easy to know what to omit in a case which I am confident affects the welfare of the country essentially, and I must yet make some remarks on the other branch of the duties of the department, viz., the communications; though, as I have before had the honour of forwarding a report on that subject, there does not remain much to be said by me here. I should first observe, that I have not seen reason, upon further consideration and experience, to alter my views of that question (as stated in the above-mentioned paper) as to the indisputable superiority of railroads on every account in this country; but at that time I by no means expected that there would be so great a traffic as I have since seen reason to expect. This so far alters the case as to make it, in my opinion, a matter beyond all doubt that a single railway will pay most abundantly on any of the great lines, and on some I think it may even be advisable to lay a double line.

47. The principal point which appears at present to require consideration is, whether upon the whole it is better to repair the present roads at a comparatively moderate expense, or to make railroads at a much greater. This seems to me capable of a very easy solution. I take it for granted, that it will be allowed that capital can be obtained at five or six per cent., to almost any extent. If so, the question seems to be reduced to this point, upon which kind of communications would it make the best return? That which will yield most must of course be the best for the country. Now, the utmost that can be done by means of common roads will not reduce the expense of carriage one-half, probably not one-fourth; or, in other words, it would not produce such effects as to enable the Government to levy a toll worth mentioning; so that the capital must be either paid out of the taxes or borrowed, and the interest form a permanent charge upon the Treasury. This would certainly be better than leaving the communications as they are now; but what will be the effect if railroads are constructed? The expense of transport will be reduced, at least, as much as to one-twelfth of what it now is: on the Red Hill railroad, one bullock drew 18 times as much as on a common road. Then, supposing the present traffic on any line to be equal to 100 tons per day,—

	Rs.	*a.*	*p.*
The present daily cost will be, per mile, at 2½ annas per ton - -	15	10	–
Or, per annum, about - - - - - - - - - -	5,700	–	–
Deduct $\frac{1}{12}$ for the expense of draught with railroad - -	475	–	–
	5,225	–	–

Sum

* Increased cultivation, 46,000. Estimated cullums, 35,000.

† The increase of cultivation this year above the last is 2,000 vaylies, in revenue, *Rs.* 80,000, besides the saving of crops on lands previously watered.

Sum remaining to cover the interest of capital, expense of management, repairs, &c.

Interest	5 ½ per cent.
Repairs	2 „
Management	2 ½ „
	10 „

	Rs.	*a.*	*p.*	
If the first cost is *Rs.* 6,000, the annual outlay will be	600	–	–	
Net annual income	4,625	–	–,	or 76 per cent.

And, supposing that the first cost should be three times as great as above estimated, or *Rs.* 18,000 per mile, which will probably be beyond what any person will think a single line would cost, then—

	Rs.
The annual outlay will be	1,800
Receipts, deducting draught	5,225
Net returns upon *Rs.* 18,000, or 19 per cent.	3,425

48. This is the total advantage to be gained by it, supposing the rate of carriage to be the same as at present; in what proportions it may be advisable to divide this between the Government and the public, is a separate question. Thus, to make common roads, so much money must be expended by Government and so much annual expense incurred, and no direct returns whatever can be realized. Railroads will not only literally cost nothing, because the capital can be obtained for asking for it, and the railroads will pay the interest, but will yield a large revenue besides. Before anything can be done of any consequence in improving the common roads, the state of the treasury and of taxation must be carefully considered; if railroads are to be constructed, nothing is required but to begin upon them at once; the less surplus revenue there is, and the more severe the taxation, the more advisable at once to commence upon these works. If once this important principle of using the public capital upon public works is recognized and acted upon, there will no longer be any limit to the power of Government to improve the country. It has already been extensively brought into action in America. If a Government does not make full use of the confidence which it has established in its subjects, by acting upon upright and sound principles, it throws away so much of the power which it possesses of promoting the welfare of the country. In cases of necessity and emergency, as in times of war, this confidence is without hesitation taken advantage of; and if it is thus made use of in a case where it entails a permanent loss upon the country, I cannot conceive what reason there can be for allowing such an invaluable portion of the power of the Government to be thought unavailable when it might be used to increase the wealth of the state. Supposing 1 crore of rupees employed in this way, and that it would only lay 1,000 miles of road, the direct saving to the country, or annual increase to its wealth, would be 40 lacs of rupees, if laid out on lines where there was traffic to the extent of 100 tons, not taking into calculation the innumerable indirect sources of advantage, which would at the least double that sum. I have supposed that lines can be found on which the traffic is 100 tons per day. By the returns of the traffic on the Adyaur Causeway, it appears that in goods and travellers it was equal to nearly 400 tons per day; on the great West and North lines leading into Madras, it could hardly be less than 600 tons, and if the cost of carriage and travelling was greatly reduced, as it might be, it is more than probable that it would be 7 or 800 tons per day. At one place in Tanjore, the average of 15 days was 172 tons in goods and travellers, bandies only; on another, 75 tons. It is often asked what is to be carried on the railroads, as though there was no traffic in the country, and I have no doubt that the extent of traffic shown by these returns will surprise most people; but the number of travellers is still more remarkable. In the Adyaur Causeway, the average of 16 days is—

Foot passengers	3,320
Palanquin ditto	7
Carriage and bandy ditto, reckoning three to each	421
Persons	3,748 per day.

In one place in Tanjore, the number of men travelling on foot was 1,555 per day.
At another place in Tanjore, the number of men travelling on foot was 1,287 „

49. Supposing that 16 persons are equal to a ton, and that the rate charged is one anna per ton per mile, the poorest class of travellers might be conveyed at one anna for 16 miles, which would bring it within reach of almost all; and it may be confidently expected, that if travelling in this country is rendered thus cheap and quick, that the number of travellers would be increased in many situations, at least, as much as in England, that is, three or four-fold. On a great line in the neighbourhood of Madras, it would probably be not less than 5,000. On several of the roads in Tanjore it would hardly be less than 3,000 per day, nearly equivalent to 200 tons.

50. I would now beg to make a few remarks on the details of the department. If these

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two branches of its duties are to be vigorously attended to, I consider the following as absolutely necessary, but not sufficient to make the department what it ought to be.

For one division, consisting of three collectorates—

1 Civil Engineer.
1 Head Assistant.
3 Second Assistants.
7 Surveyors.
7 Maistries.
9 Draughtsmen and Writers.

Besides extra officers and surveyors to be employed on any new or extensive work.

This will, of course, appear at first quite unnecessary to those who compare it with the present strength of the department; but if it is compared with the wants of the country, the present state of irrigation, the amount of money required to be expended, the space of country over which the works are scattered, the nature of the duties, the effects of the climate upon Europeans, and the value of the property at stake, I am not afraid of its being found by any means too great.

51. In proportioning the numbers, I suppose the principle to be acknowledged, that it is waste of money to employ any person in doing duties that can be done by others at a less cost; this principle has indeed been hitherto rejected in arranging the department, and thus a miserably weak and inefficient department has been still further weakened. An Assistant on *Rs.* 400 or *Rs.* 500 a month, and a Surveyor on *Rs.* 176, are employed in making two copies of their own diaries, which could be done by men on *Rs.* 20 a month; and an experienced Surveyor, capable of planning works, is employed in copying plans of tunnels and cutcherries, which require no thought or ability at all, and for which men could be obtained at one-third of their cost. It is very remarkable that such a system has never been thought of in other departments of Government; the idea of employing a Superintendent of one of the Government offices, on *Rs.* 200 or *Rs.* 300 a month, in copying papers, would at once be seen absurd, much more so an officer on *Rs.* 400 or *Rs.* 500. I am quite at a loss to understand how such a plan could have escaped observation. I propose that every officer should invariably have attached to him—

1 Surveyor.
1 Writer and Draughtsman.
1 Maistry.

And I cannot see how, on any principle of economy, he can be allowed to be without them. If they are not with him, he must of course do their duties, and in the meantime, who should do his? If he has no Surveyor, a young European officer, not at all inured to the climate, must be employed upon a duty which, of course, he cannot long stand, and the consequence is, that besides being rendered often unfit for the execution of his proper duties at the time, he is after a few years (if he lives), when he is beginning to learn his business, obliged to leave either the country or the department.

52. From this and other causes, we have never had an experienced officer in the department since I have been in the country, who was not quite unequal to his duties. The Civil Engineer's office, I propose, shall consist of one Surveyor, one Draughtsman, two Maistries, and three Writers; one Writer was probably enough formerly, but certainly it is even now quite insufficient. If there is anything like a vigorous and comprehensive system adopted, less than this cannot possibly be adequate. One or two of the Surveyors, if not more of the senior ones, should also have Writers.

53. The above scale allows one officer constantly in each district, besides the Civil Engineer of the division, for there will be one of the officers almost invariably unfit for duty, and one employed on particular works, such as examining works of great magnitude; and allowing one Surveyor to be absent, there will be two disposable to detach on any separate works, besides those employed with officers. There will thus be for the general duty of inspecting works, only one officer and Surveyor for each district; they will have a range from 100 to 120 miles long, by 80 or 100 broad, an expenditure to control of not less than one lac, and from 1,000 to 3,000 works to look after, besides the communications. This must be a less force than a sound economy calls for. Further, unless a considerable number of officers are employed in the department, it cannot be expected that men of experience will be always obtainable to take charge of divisions. The Board will excuse my alluding to my own history as an exemplification of the effect of the system hitherto followed. In 1822, after being half a year in the country, I was sent to be an assistant in the Southern Division; the officer I was placed under had not been long enough in the department to gain any considerable stock of experience. I remained with him one year, the principal part of my time having been spent in surveying and copying plans and diaries. I was then placed under the Superintending Engineer at Madras for a time, and from thence was ordered to Burmah; at the conclusion of the war, I was appointed a Civil Engineer, because there was scarcely an officer in the country of any standing who had been in the department, and it was not to be supposed that a married man would willingly undertake the charge of a division of the size they then were, which would oblige him to be almost always separated from his family. When I thus got charge of a division, I was perfectly ignorant of the duties, and having a range of five collectorates, and no other officer with me, I was very soon worn out by fatigue and severe attacks

attacks of jungle fever, and after three years was obliged to return to England. On my return I was again appointed to the department, but my health so soon sunk under the duties, that I have since been scarcely half my time actually employed. I am now, excepting one, the officer of longest standing in the department, and yet have had only about seven years' actual experience; having been also, except the first year, without any one to instruct me. If such a state of things was allowed in other branches of the service, what could be expected? If the irrigation is found annually to diminish under such a system, it cannot be a matter of surprise.

54. But if the department is to be increased greatly, the question arises, where are officers for it to be found? First, there are now a good many officers in the corps of Engineers altogether; but it so happens that at present there is an extraordinary number of officers absent on sick certificate, and it is very remarkable that so great a number of young officers have so soon lost their health as to be obliged to return to England without having done any duty of consequence. We may, however, fairly expect that, after a time, with our present numbers, we shall have more disposable officers. Secondly, I must presume so far as to observe on the grievous loss of Engineer officers employed in making roads with the Sappers; I suppose that it will be generally considered that the plan of officering the Sappers by Engineers has not answered the end proposed. They are now employed upon precisely the same duties as Line officers were before, and which undoubtedly do not require an Addiscombe education, while duties, which cannot be done without instruction in particular branches of knowledge, are left undone for want of these very officers. There is, indeed, a saving in employing Engineers in that way, as the old Pioneer allowances were withdrawn; but this saving is much more than counterbalanced by the employment of men on duties which are of less importance than others which they are capable of performing. Thus at the very time that several officers (educated at a great expense) were employed upon works to which numbers of officers of the Line are perfectly competent, the Board were waiting for many months last year for an officer capable of superintending the levelling of the line from Madras to Arcot, and the Tank Department wanted several officers even to complete its present complement. And there are now two officers of Artillery employed on the duties of Engineers, while there are officers of Engineers employed in the duties of Line officers. I should also mention that an officer of Engineers is employed in Travancore; it seems scarcely advisable to send officers to foreign states if they can really be advantageously employed in the Company's country; thus, rather than let the irrigation of the country be neglected, perhaps it might be deemed proper to call off every Engineer officer from less important duties.

55. But I beg strongly to recommend the consideration of the question, whether it would not be much better not to confine the department to Engineers. There are now abundance of officers in the Line and in the Artillery who have been at Addiscombe, and doubtless many who have not, who are perfectly equal to these duties, and would gladly undertake them. If the department is increased, and thrown open to all, I have not a doubt that the Government will soon find that they have many servants in the other branches of the army who will be far more valuable in this department than where they now are, having a natural turn for such duties. Nor would I exclude those who are not in the Company's service. I would propose that the highest appointments should be open to any one who could fit himself for them. I cannot see anything in the nature of the department which can make it advisable to keep it exclusively for one body of men; a turn for these duties may be found in any class, and in England civil engineering is open to all, and the effects of it are very evident and beneficial.

56. I trust that there is now no occasion for me to say much on the importance of this subject. Though the country cannot advance without good judicial and revenue management, yet it is indisputably certain that nothing will avail unless the irrigation and communications are attended to. While the population are mainly dependent upon the local rains of so precarious a climate for their cultivation, four-fifths of the population must be employed in merely raising food; every five or six years we must witness the deaths of tens of thousands by famine, and the great body of the people must be without clothing or anything but a bare subsistence, even in fruitful seasons; and, without communications, nine-tenths of the natural treasures of the country must continue to be useless. At present, what cannot be procured on the spot where it is wanted, cannot in general be had at all. A great portion of the population are even deprived of salt, which the country so lavishly produces, because of the expense of transport. Above all, the want of communications is, and ever must be, almost a total bar to the progress of knowledge and improvement generally.

57. Many attempts are now making to improve the state of the people in various ways; but unless there is freedom of communication throughout the country, it will be perfectly impossible that such improvements can spread rapidly. However well any new plan succeeds, if the communications are not opened, it will never extend. And again, if we want to promote the general wealth and comfort of the community, we must be sure to lay a good foundation by supplying them with plenty of food. If a man was so circumstanced that four-fifths of his time was employed in getting only just enough of the plainest food to keep him in health, and the remaining fifth was not sufficient to enable him to supply himself with two yards of cotton cloth, with a prospect every four or five years of being either starved to death, or in imminent danger of it; and if we were to offer to show him how to grow sugar, he would probably say, "If you will first put me in the way of insuring to myself a supply of food and a bit of cloth, and a combly, without my whole time being taken up about

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about them, I will then employ some of what time I have to spare in raising luxuries that I want myself, or that I can exchange for others; for it can scarcely ever answer to a country to bring much food from a distance; it will always be advisable to raise most of it on the spot; but when a country is in a state to provide abundance of food for its population, manufactures, &c. will flourish. Again, the price of exportable produce, of course, depends entirely upon the facility with which food is raised, and upon the price of produce entirely depends its capability of competing in foreign markets; thus, if food could be raised in this country with one-half of the labour that it has hitherto required, cottons, iron, &c. could be produced at greatly diminished prices, and the profits upon them in foreign markets proportionally increased.

58. It is often remarked that there are so few manufactures in the country; how can it be otherwise, when almost all are required to raise food, and of the remainder such a number to carry it about; and when everything must be brought to where it is required at such an enormous price, at a price, which, if it existed in the same proportion in England, would at once destroy nine-tenths of the traffic of the country.

59. If this view of the irrigation question is not upon the whole a fair representation of the case, how does it happen that Tanjore, the only district well irrigated and producing a sufficiency of food, is the only district of the 12 that is in every respect regularly advancing. If it really is not a correct view, it must at least be allowed that this is a question which should not be lost sight of till it is fully investigated.

60. I am quite satisfied that there is nothing in the natural state of the Carnatic which should prevent its being one of the most populous and fertile countries in the world; and I think that the results of what has been done in Tanjore and in South Arcot, even without considering the utter insufficiency of the Tank Department, are such as to give the fullest assurance of ample success to the most extensive system of operations. Everything is ready to commence upon it. With a healthy climate, abundance of fertile soil, unlimited mineral treasures, especially the finest iron probably in the world, ample supplies of water, if taken care of, an increasing population, a surface extraordinarily favourable for communications, internal and external peace, and almost any amount of capital at the disposal of Government (for crores can be obtained from England if necessary), there is really nothing wanting but action, to produce such a change in the whole face of things as cannot now be conceived.

61. The following is a summary of my views on this subject:—

1st. That the nature and importance of the subjects of the irrigation and communications has been hitherto altogether misapprehended, leading to a loss of revenue, and a retardation of the progress of improvement in the state of the community, which is quite beyond calculation.

2d. That as respects communications, no country whatever can prosper if they are not made the very first objects of attention; and that as respects irrigation, it is in this country, owing to the peculiar character of the climate, undoubtedly the very first subject to be attended to; inasmuch as we cannot rationally expect that there will not be famine and want of every kind, just in proportion as the cultivation is more or less dependent upon local rains, without the help of artificial works.

3d. That the expenditure upon the irrigation has certainly not exceeded one-third of what, upon the strictest principles of economy, it ought to have been; and that from the little consideration that the subject of communications has been thought worthy of, there has been in most cases nothing at all expended; and in others, as in the Hyderabad and Masulipatam road, and in that from Madras to Poonamallee, the most expensive and unaccountable expenditure, totally disproportioned to the advantages to be attained, and to the real necessities of the case. The former cost at the rate of *Rs.* 10,000 a mile, the latter *Rs.* 50,000. Most of the other great lines of road in the Presidency are literally at this moment impassable, at times, for want of a few bridges and trifling works, that would not cost more than *Rs.* 200 per mile; and some other lines on which bridges were built, are now, and have been for many years, totally impassable from want of repairs, that would not exceed *Rs.* 20 per mile per annum. These things could not possibly have happened had the subject been viewed as it really is, one of the very first subjects to be attended to.

63. 4th. That when once a country is favoured as this is with a strong and upright Government, the only things which can possibly support effectually internal arts and manufactures, and foreign trade, are an abundant, certain, and cheap supply of food, and rapid, easy, and cheap transport; nor without these can a nation make rapid progress in knowledge. While a people are scarcely provided with food, and not at all with clothing, they cannot be expected to think much of any other things; and while intercourse is so restricted, the state of a community approaches to that of men in a prison, each one shut up in a separate cell, so that the progress of the individuals depends wholly upon the discoveries of their own mind, instead of having also the full benefits of all the thoughts of the other inmates of the place; whereas, just in proportion as the freedom of intercourse approaches to completeness, the state of each individual approaches to the state of a person possessed in himself of all the powers and capacities of the multitudes of minds of which that community is composed.

64. 5th. With respect to what should be done in our present circumstances. That such a systematic

a systematic arrangement should be made for the conducting of public works, as would secure these branches of the management of the country one of the first places among the subjects which require the attention of Government, either by the establishment of a separate Office or Board of Public Works, on a liberal footing, or by such other arrangement as may appear necessary.

65. 6th. That every officer of Engineers, whose present occupation can possibly be taken up by others, be immediately made available for this department.

66. 7th. That the department be thrown open to every person, whether in the service or not, who can fit himself for it.

67. 8th. That at least double the present expenditure should at once be allowed for the irrigation, besides very large sums for the communications.

68. 9th. That capital should be obtained on loan, and on no account that any money should be paid out of the treasury for improvements. Capital paid from the treasury costs the community perhaps double its actual amount, taking into consideration the expense, &c. of collecting, the cramping of private enterprise by the diminution of funds of individuals, &c. &c., while capital obtained on loan costs absolutely nothing. If *Rs.* 10 are taken from a man as a tax it is sheer loss to him, and it must often happen that it is taken when he has an opportunity of laying it out to great advantage; if it is taken on loan, and laid out in a way that will yield both public advantage, and actual returns in money besides, more than sufficient to pay the lender his interest, no individual loses anything, but the community gains. And for such works as bridges, upon which it is not advisable to levy tolls, how much better is it that the interest of its cost should form a permanent moderate charge upon the community, than that the cost itself should be paid at once: in the latter case the present moment must be heavily taxed to obtain an advantage, which will only be realized in a course of years; in the former the advantage is only paid for as it is actually possessed; in the latter case works may at once be undertaken to a prodigious extent, and the country greatly improved without delay; in the former only a small extent of work can be undertaken at first, and the community must wait many years for others equally necessary.

69. 10th. That various details of internal management now wholly omitted, are indispensably necessary to keep the department in any kind of order, and prevent the recurrence of such mistakes as I have endeavoured to show have hitherto been committed in it; such arrangements as these, for instance, annual reports on the state of the irrigation, both from the Civil Engineers and Collectors. A general annual report from the Board of Revenue; rewards and penalties to secure every person in the department, obtaining a competent knowledge of the language of the division; examination of officers, &c., and other details, which in almost all organized departments are considered necessary to insure their efficiency, but of which this has hitherto been thought quite unworthy.

70. I trust the Board will be pleased to excuse the length of time that I have taken to prepare this Report. Since I resumed charge of the division, I have had to discuss and estimate for all the main works to be proposed for execution next year, and respecting which the lateness of the season would not admit of delay. I have also had to obtain and prepare various papers that affected the question; and all was to be done while moving about, and with a single Office Writer, who had of course all the current writing business of the department. It has in fact taken three or four weeks to get this paper copied, and I have been obliged to employ a Surveyor at last in making a fair copy.

71. For the last week I have also been fully occupied with the duties entrusted to the committee appointed by Government on the affairs of the Indian Iron Company, and which are not yet concluded.

Since writing the above a letter has been received from the Board, which reminds me of one point of this subject which should not have been omitted.

The regulations make no particular provision respecting the preparation of estimates for new works of small amount. A Surveyor or young officer in his tour, finds an opening for the improvement of the irrigation of one or two villages, the cost of which will be perhaps *Rs.* 1,000. He examines it, and reports upon it, and the Civil Engineer having made all the inquiry he can about it, approves of it, and perhaps recommends it for sanction. The papers are returned for his personal inspection of the spot, and report. He has now the choice of three things, either to go at once to the place, which may take him from a week to a fortnight going and returning, in which case his pay and the pay of his establishment will cost the Government from *Rs.* 350 to *Rs.* 700 directly; and as it will take him away from other far more important duty, the indirect loss to Government cannot be less than three or four times as much, or from *Rs.* 1,200 to *Rs.* 2,400, which will double or treble the cost of the project, and probably make that an unprofitable scheme which would otherwise have been a profitable one; or, secondly, he must wait till other more important duty leads him into that part of the division, which may be even several years; for his time is so totally disproportionate to his duty, that he cannot see a tenth part of the division every year, unless he very greatly neglects the great and important works in it; or, thirdly, he must entirely give up all new works of small amount. The peculiar circumstances of the Tank Department, in two respects, require that some specific plan should be settled respecting the expenditure of such small sums; viz., first, that the number of works in a division is so greatly beyond the utmost power of the officers to attend to them; and, secondly, that they are spread over so great a space, that in a country where there are no facilities for travelling,

Appendix (B.)

the inspection of the most trifling work may require a fortnight of his time. Even when the department is put on an efficient footing, it will often cost more than a small project is worth for the Civil Engineer to inspect the spot: but at present it will do so in the majority of cases. In a fixed office, where all the duty is done by inspection of papers, the head of it can afford to look into very minute matters, because it costs him little time; but where the business requires the inspection of tracks of ground at a wide distance from each other, the case is entirely different; yet even in the former case it is not always considered necessary that every case should come under the personal investigation of the head of the office; for instance, in the judicial line, the inquiries of a Moonsiff are considered sufficient in cases of small sums, and he is allowed to decide them; were the Judge required to investigate every case, the only result would be that his time would be so swallowed up that he could not possibly give the important cases that consideration which they deserved. Possibly it might be arranged that for works of a certain amount, as *Rs.* 500, it might be sufficient that a Surveyor or native Superintendent had personally inspected the spot, and that the project had been investigated by the Civil Engineer or his First Assistant; for larger works, as *Rs.* 1,000, that it had been personally inspected by an experienced Assistant, and investigated by the Civil Engineer; and for works of *Rs.* 3,000 and upwards, it should be required that the Civil Engineer should visit the spot. It certainly seems advisable that this point should be examined, and some definite plan decided upon, otherwise either nothing now involving only a small expenditure can be done in parts of the country at a distance from important works, or the Civil Engineer's time must be so taken up with them, as to prevent him effectually from duly considering the more important cases which may come before him.

I am, &c.
(signed) *A. Cotton,* Captain,
Civil Engineer's Office, 13 December 1837. Civil Engineer.

Appendix (C.)

No. 316.

To *J. D. Bourdillon,* Esq., President of the Public Works Commission.

Sir, Civil Engineer's Office, 1 June 1851.

Appendix (C.)

In reply to the additional questions transmitted from the Commissioners, dated 2d May 1851, I have the honour to state,—

1. The Commissioners are aware that the main works required for the improvement of irrigation of this division have been brought forward by Captain Lake and myself, viz., those required for the two great Deltas of the Kistnah and Godavery; that both sets of works have been approved and sanctioned by the Honourable Court without reserve; these works providing for—

1st. The irrigation.
2d. The drainage.
3d. The protection from river floods.
4th. Water communications.

The Godavery annicut is now very nearly completed, and so far as to be in full operation; and the water has been thrown into seven channels, extending through the Delta, and filling all the old ones. A large aqueduct across a considerable branch of the river, about eight considerable branch channels and one main one, about 15 locks, 60 or 80 miles of river embankments, and all the small branch channels remain to be executed; probably eight lacs, and three years, will be required to complete the works, and irrigate, &c. a million acres, at an expense in interest and management of about two lacs a year, or 3¼ annas per acre per annum.

The Kistna works, though sanction for them arrived months ago, have not yet been begun. It is understood to be arranged that that part of the division will be separated from this, and placed under Captain Orr.

2. The only thing that it seems necessary to say in reply to this query, in connexion with the Godavery works is, that as the summer water is not sufficient to water the whole Delta, when the river is at its lowest, it will eventually be desirable to store water in the freshes. At present there is perhaps not more than 100,000 cubic yards per hour for a month or more in some seasons, sufficient for only 33,000 acres of sugar, or 1,50,000 acres of cotton; for some years probably this deficiency will be little felt, and therefore it is not of immediate importance. But it may be well to mention that there are two fine lakes just at the point where the river leaves the hills, so situated that they might, at a small expense, be filled to the level of the river flood, and drawn off in the summer months, to the extent of perhaps 12 yards depth. One of those I have seen, and it might thus be made to store up perhaps 20,000,000 of cubic yards, or 30,000 cubic yards per hour for a month. The other is also capacious, as I am informed, but I have not seen it. These reservoirs might also be used to irrigate lands above the level of the annicut, but I think it would be far more advisable to reserve them for the use of the Delta, where they might be of incalculable value in case of a year of very extraordinary drought. No doubt many other good sites for reservoirs might be found, so situated as that they might be used to support the Delta irrigation, if necessary.

3. With

3. With respect to those parts of the division which are above the Delta, there is no limit to what might be done to improve the irrigation. Urgent applications are continually made to me by all the Revenue Officers and by the Commissioner, for officers to plan and estimate for works, by which the small rivers may be turned to better account, and in which 100 per cent. and upwards might be obtained for the outlay, but I have not been able to attend to them. Several of the zemindars also are very anxious to have the aid of a European officer to plan new works, or the improvement of old ones; and some have applied to officers to give up a portion of their time regularly to their estates. There are a great number of tanks and channels now existing, not one of which is not capable of being greatly improved. There is thus an immense field for improvements in the parts of this division, which are above the level of the annicuts. There are numberless individual villages in which a revenue of *Rs.* 1,000 to *Rs.* 5,000 is lost for want of some comparatively trifling work. The undulating country, sprinkled over with low hills, which extends from the Deltas to the north-west, is so full of tanks and good sites for tanks, that almost the whole of the water of the numerous streams might be turned to account, instead of, as at present, helping to drown the flat country near the sea. I should also mention, that the whole bed of the Colair Lake should of course be eventually irrigated from the Kistnah and Godavery, instead of the water being allowed to collect in it and form a tank; as it is all above tide water it can be drained with the greatest ease; indeed it is at this moment being emptied, in order that it may be supplied with fresh water when the freshes come, as the soil is slightly saline, and the last of the water retained in it becomes brackish at the end of the hot season.

4. The whole division is almost absolutely without roads, excepting about 12 miles of the great northern line from Rajahmundry, and a road from Narsapore towards Rajahmundry, about 30 miles, not yet completed; there is, I believe, no metalled road in the division. The road from Masulipatam towards Hyderabad was undertaken at one time by the Pioneers, and about *Rs.* 2,000 a mile, I think, spent upon it; but the officer employed having no knowledge of road-making, and no metal having been laid on it, I understand it has never been practicable in the monsoon, and it was so bad when the Commander-in-Chief lately passed along it, that he obtained an order for its completion to be estimated, which has accordingly been done. In the Delta there is not the least attempt at a road; in the monsoon a palanquin cannot proceed faster than at a mile an hour; even on the Great Northern Road, just out of the Delta, I have known a gentleman four hours riding seven miles. Of course there is no possibility of moving produce by land to the ports and markets for about five months in the year; but the villages that are close on the banks of the rivers can send their produce by water; though, from the strength of the current, the irregularities of the bed, the want of towing-paths, the liability to a heavy sea, from the great breadth of the river, and other causes, the navigation is very imperfect, and this mode of communication is generally very circuitous. It is, however, carried on at about four pice or one-third anna per ton per mile up stream, and three pice down stream, so that when and where practicable it is very cheap. But it is quite stopped in the high freshes and in the dry months.

5. I should also mention with reference to the communications generally, excepting the Great Northern Road, that there is no recognition of the Government authority whatever with respect to them. A Brahmin superior Ryot, a head of village, or anybody that thinks himself a person of consequence, ploughs up, fences across, cuts a channel along, or in any other way he thinks proper, takes possession of any line of road, and nobody interferes with him. I have met with cases of this sort every where. In one place where the river bank formed the only practicable road, and was, in consequence, a line of great traffic, a principal Ryot had put a line of stacks all along it, occupying every inch of its breadth for some distance, so that every passenger had to go down into all but impassable mud. The perfect lawlessness of the people in this division, who from caste, office or money, look upon themselves as important persons, is one of the most curious of the circumstances of these districts.

6. I should not omit to mention the river embankments in this connexion. Where we have completed the new banks, making them from three to four yards broad at the top, being composed of loam, with a large proportion of sand in it, they form excellent communications at all seasons, and are really a very important addition to the means of travelling. They, however, of course only run in the direction of the river, and afford no help to those who have to move across the Delta. On this account I have long purposed to estimate a line to run direct from Cocanada to Masulipatam on a straight course, which by connecting all the lines of embankment would alone afford a vast extent of communication—such a line just raised above the general level a foot or so, and sanded or covered with the fine gravel procurable here, and which might be conveyed by water, would cost only *Rs.* 200 or *Rs.* 300 a mile. This, however, is only for foot passengers and animals, not for wheeled vehicles. With respect to carriage roads there are two things to be said: 1st. As there is at present not a mile practicable, excepting the Narsapoor and Rajahmundry road already mentioned, there is no use in commencing upon them unless it is intended to introduce them generally, and this is a thing we cannot think of doing till the irrigation works are completed; and 2dly. As the Delta will so soon be intersected in every part with excellent navigable channels, so that no village can be more than two or three miles from a water communication to the ports and to every other part of the Delta, of course there will be very little heavy traffic by land, and no doubt as the people get more into the habit of it, almost all the passenger traffic also will be by water. Even at present on one line where there

Appendix (C.)

there is a constant cooly traffic, and water can be conveniently used for a distance of only 12 miles, boats are always in attendance to convey the coolies that short distance, a clear proof that the people will soon learn to make full use of the channels. From the present cost of river transit, and from what we have seen this year in the use of the Thooliah Bagah, I think we may safely reckon upon the channel transit being carried on at two pice, or one sixth of an anna per ton per mile, and as the average distance of villages in the Delta from the ports will not be more than 30 miles, it would cost only five annas per ton for the conveyance of produce to the port, a rate which would not be felt in the coarsest goods. I have in my answers to former queries (*see* Appendix E.) given an account of the water communication that will be formed in connexion with the annicuts for 240 miles along the line of the Northern Road, and which might be so easily extended to Madras.

7. With respect to the communications with the distant interior, there cannot be a shadow of a doubt that the navigation of the Godavery is the grand thing to be attended to. The cost of a single mile of railroad would probably make the whole 450 miles from the coast to Woony on the Wardah, within 80 miles of Nagpoor (which is already navigable for a great part of the year), practicable throughout the dry season. The Government have, at the recommendation of the Revenue Commissioner, proposed to the Bengal Government an expedition for the examination of the river, and I have not the least doubt it will lead to important results if judiciously managed. Almost the whole basin of the Godavery is inaccessible to trade at present, on account of the 300 or 400 miles of land carriage without roads, which cannot be avoided, while this noble river is neglected. And it is remarkable that just at this moment the attention of merchants is much turned to that tract, and agents at Coringa have unlimited orders for hides, wax and other things, the produce of it. From its having been hitherto almost cut off from the rest of the world, the value of money is very high, or in other words, all produce is very cheap, offering a peculiarly favourable field to the merchants. Compare the effects that can be produced by opening up the transit by this river, and its branches, with what could be done by equal sums expended on railways which, if executed for nothing, would even then be many times more expensive to work than it would be to navigate the river. Our steamer here of 20 horse-power costs about $2\frac{1}{2}$ annas a mile, or the same as a single bandy on a common road, or as perhaps two tons on a railroad, a lively proof of the enormous advantage of natural water communication where it can be obtained. When we look at the vast cotton tracts of Candeish and Berar, and the many other productions of a basin of 100,000 square miles on the one hand, and the safe port of Coringa on the other, perhaps the cheapest for shipment in the world, it is not easy to over estimate the importance of opening a water communication between them. I need only just mention also the great point of opening out this dark corner of the earth to European influence.

But it would be better to refer the Commission to the correspondence between the Commissioner of these districts and the Government, on this subject.

8. From all that I have learnt respecting the works in this division they are in all respects, both as to original construction and present condition, in a most imperfect state. With respect to their former state, it is to be observed that, 20 years ago, by far the greater part of these districts was in the hands of zemindars, and a great number of the estates have only come under Government management very lately; much is still under zemindars. The state of the works under the zemindars seems to have been very various, but I judge that almost all of them took much better care of them than our Government has done. In one, the Pittapoor estate, I have satisfied myself that the works were in excellent repair under the grandfather of the present zemindar, but at his death, the estate came under Government management, in consequence of a minority, and when the estate was given up to his son, 15 years afterwards, the whole of the works were in a complete state of neglect and ruin. I inspected several of them at the request of the zemindar. During the last 10 years some little has been done to put the Government works in order, but since I came into the division, my time and attention has been so taken up with the annicut project, that I have not been able to do anything about the old works out of the Delta, further than to urge a liberal outlay upon them by the Collector's Department. I have reason to believe that most of the tanks are in want of complete revision; they have no proper calingalahs, sluices, supplying channels, &c., and the drainage of the country is in many places as bad as the supply. Below the Colair, numbers of villages are submerged till the rains are over, and begin to cultivate when they have hardly any hope of rain enough to secure a crop; late last year, at the very end of the rains, I passed in my boat over a great extent of water, many miles together, and if I had not been assured that there was a talook underneath, I should have supposed I was in the Colair Lake. In one place, I saw the people punting in a piece of water, which I was informed they were going to bale out, that they might begin to cultivate; this was the only sign of land and cultivation that I saw in 15 or 20 villages that I passed near. The drainage of this tract will of course come under our present operations, but it shows the state of neglect which was permitted in these districts; no wonder that, under such management, this rich country yielded only one-third of what Tanjore did in revenue, though naturally the latter is much inferior to it.

I have, &c.

(signed) *A. Cotton*, Lieut.-Colonel,
Civil Engineer, First Division.

Rajahmundry District,
Camp Dowlaisweram, June 1851.

P.S.—Since writing the above, the orders of the Bengal Government have been received, withholding

withholding sanction from the Godavery expedition, on the ground that they cannot see the use of it. On this subject I now beg to make the following remarks:

1st. This river affords the cheapest possible access to that part of India where the best cotton for the English market is produced at the cheapest rate, and it is mainly for the purpose of getting at this cotton, that the line of railroad from Bombay, 350 miles, has been proposed, at a cost, I suppose, of 200 lacs (*see* Mr. Chapman's book on this subject), so different are the judgments of different parties on the importance of the communication with this tract of country. One thinks it worth an expenditure of 200 lacs, the other thinks there is so little to be gained by it, that it is not worth an expenditure of *Rs.* 10,000 to examine the river, which has been ascertained to be navigable.

2d. This is one of the innumerable proofs how impolitic it is to trust the interests of one Presidency to those who belong to another. It cannot be expected, it is impossible, that others can take the interest in our own Presidency, which we do ourselves. Local and personal knowledge will necessarily rouse men to exertion, as nothing else will. It appears to men who have passed their lives in Bengal a matter of no importance whether the largest river in Madras, leading into a fine cotton country, and bringing us as it were 200 or 300 miles nearer some of our most important cantonments, is navigated or not, the subject is dismissed with three words. How differently is the navigation of a Bengal river treated.

Nothing can be more paralysing than this subjection of one Presidency to the inhabitants of another. If each carried on its own improvements independently of the other, but directly under the Honourable Court, instead of efforts to keep back the progress of the others, each would be stimulated by a wholesome rivalry to activity in the race of improvement. Were there really a Council in India equally independent of all the four Presidencies, it would be different, though even then the one they resided in, would inevitably be advanced at the expense of the others, such is the power of local connexions. The disheartening and paralysing effect of this subjection of our local questions to the judgment of men of another Presidency is felt continually, and it is productive of nothing but mischief; any restriction respecting the amount of expenditure may be laid by the Honourable Court, so that the expenditure here may not require to be known in its details for the sake of financial arrangements, and the questions about individual works need then to be referred to the Court only; which being composed of men from all the Presidencies as well as others connected with none of them, certainly forms a much safer tribunal to pass judgment on our proposed improvements than the officers of another Presidency. If we look to the actual operation of the present system, it has certainly most seriously retarded our progress, and never in the remotest degree tended to advance the works of this Presidency. We have never heard of an important public improvement in Madras suggested or even urged by Bengal; the very mention of such a thing sounds absurd; on the other hand, the certainty which the Government here feel, that if any reason or excuse can be found for stopping one that is proposed, it will be rejected, has of course a most powerful tendency to prevent the Government from running the risk of incurring a refusal. This is one of those many things that have combined to keep this unfortunate Presidency in the rear in respect of improvement. Whereas, were every Presidency free to carry on its own improvements, the only alternative the others would have, in case of one appearing likely to have the honour of taking the lead, would be to bestir themselves the more.

Besides the evil arising from this system in entirely preventing works, there is at all times the evil of delay—a most notable instance of this lately occurred here. The estimate for the extension of the Vezasweram branch of this annicut was so long delayed, that it was impossible to execute the work before the monsoon, and even when the papers had actually been approved at Calcutta, they were not sent to Madras for a month or more; and had I not, in anticipation of such an event, proceeded exactly as if I had known that the work would not be sanctioned, and done all I could to secure that branch without extending it, most serious mischief might have occurred. It appears from this that the most imminent danger of the most important works here cannot prevent their being thus exposed to the risk of leaving them exposed to another monsoon in an insecure state.

In conclusion, I must earnestly recommend these two questions to the Commissioners. First, The particular one of the navigation of the Godavery, represented in the reports of the Collector of Rajahmundry, the Commissioner of the Northern Circars, and the Civil Engineer, first division, and also in some English publications; and, second, The general one of the subjection of each individual proposed improvement here, to the judgment of a Council entirely ignorant of our localities and circumstances, and necessarily wanting in that personal interest in this part of India felt by those who are directly connected with it.

1 September 1851. (signed) *A. Cotton.*

Appendix (D.)

Appendix (D.)

EXTRACT from a Letter from Lieut.-Colonel *A. Cotton*, Civil Engineer, First Division to the Secretary to the Board of Revenue, Department Public Works, dated 2 December 1851.

2. As to probable returns, those already obtained are an unanswerable proof that there is no room for doubt on this head. The direct returns from the villages already watered are much beyond the calculations, and if the whole Delta improves in anything like the proportion of those villages, the profits will be immense. But, besides the direct profit in increase of revenue of the watered villages, the whole district has been materially affected by the expenditure on these works. Nothing can be more erroneous than to suppose that the whole expenditure upon public works is so much actual loss to Government. Every lac of rupees spent by Government in a district materially affects the collections. I particularly insisted upon this in my Second Report, and the result here fully confirms that view. The moment the expenditure commenced here the revenue felt the effect of it; how could it be otherwise? The impoverishment of the district and the want of capital was so great, that, in a thousand cases where an improvement in a man's land, at an expense of one rupee, would produce five the same year, he could not execute it for want of capital. The dispersion of a few lacs by these works and the sugar manufactories, put life into the district, enabled the Ryots to extend their cultivation and improve it, and thus to raise a greater quantity of produce for export, by which again a large additional income is brought into the district; the exports last year amounting to 14 lacs.

3. The results upon the whole are shown by the accompanying statement of collections in Rajahmundry, by which it will be seen that after deducting the whole expenditure on the new works and repairs, there has been a net increase of collections of about seven lacs in the five years. And the present annual increase of revenue upon the average of years preceding the commencement of the works is five and a half lacs; and, supposing we continue to spend two and a half lacs per annum, even if there were no further increase of revenue, there would be still a clear surplus of three lacs a year above the former revenue. But it is still increasing, and there is every prospect of a great additional revenue this year; not less than 1,00,000 acres additional having benefited more or less by the works brought into operation this year. By one channel alone ample water for 30,000 acres has been supplied throughout the season, to lands which had not before received any help from the new works. I lately examined some of the newly watered villages, and found them entirely covered, even the mangoe tope land, with a luxuriant crop of transplanted paddy, where two years before not an acre of rice had ever been grown; the value of the old crops of cholum, gram, &c., being about *Rs.* 6 per acre, while the rice is at least *Rs.* 20 per acre. In one village, Biccavole, there has been an increase of *Rs.* 600 a year in revenue; the Government interest upon *Rs.* 1,20,000, a tenth of the whole expenditure up to this time, while it contains about 2,400 acres, only $\frac{1}{50}$ part of the lands commanded by the annicut. The former collections averaged $1\frac{1}{4}$ rupee per acre, it now pays $3\frac{3}{4}$, being an increase of $2\frac{1}{2}$ rupees per acre, at which rate the whole of the lands under the annicut in this district, and Masulipatam, would yield an increase of 30 lacs a year; and yet this village is, in two respects, inferior to the villages generally: 1st, as part of its lands are above the level of the annicut; and, 2d, it had previously some tank irrigation which the Delta villages generally have not. And if the value of the produce is increased from 6 to 20 rupees (leaving out of consideration the more valuable products, sugar, American cotton, chillies, &c.), no wonder that they can bear an increase of taxation of $2\frac{1}{2}$ rupees an acre. Further, we have every reason to believe that the energies of the people have been greatly roused by the execution of these works. The employment of so large a portion of the population at different times on the annicut and other works, has shown them the practicability of doing many things that they never before thought of; but much more have the new works effected in giving them hope, while before they were in a state of stupor and despondency. The efforts of Government to give them water, and improve their condition, has already greatly inspirited them, and every day we have increasing proofs how alive they are to the value of the new works, and how prepared to take advantage of them; continual applications are now made to me for channels to irrigate and to drain lands which the new works have not yet effected.

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But, as I have shown before, the expenditure is much more apparent than real; if two or three lacs are spent this year, a great portion of it will immediately find its way back to the treasury; and what does not, will, as capital, be the seed of future profit to the revenue. Farther, at the utmost it will only be out of the treasury a few months; about one rupee per acre is sufficient for the detail works; and I have shown how easily and certainly that rupee per acre, and much more, may be returned in annual revenue; so that it is difficult to conceive how the non-execution of these works can benefit the treasury even at present; and most certainly, if we look forward a single year, it is a ruinous way of saving. How can we draw any other conclusion than this from the actual progress of the district since we commenced the improvements? While we have spent 13 lacs, we have drawn additional revenue to the amount of 20 lacs; and yet that money has been chiefly expended on works which do not yield profit directly, as the annicut for instance; while all the works now before

before us immediately and directly affect the lands through which they pass. Lastly, had the Government to wait several years for returns, and had they to pay 50 per cent. instead of five, for capital, it is most certain that they would be amply justified in proceeding with the works; rather, I cannot see that they would be justified in stopping them after thus raising the hopes of the people.

4. As we are now so far advanced in the undertaking, I append an estimate of the probable actual cost of the improvements per acre, supposing it be considered as if it were a private speculation in which only the direct profits can be calculated upon.

Expenditure on labour, &c. - - - - - - -	20 lacs.
European and other superintendence - - - - - -	4
	24
Interest on ditto, at 5 per cent. - - - - - -	1,20,000
Annual repairs and management - - - - -	1,00,000
	Rs. 2,20,000

which, divided among 1,200,000 acres (including 2,00,000 in Masulipatam) is about 3 annas per acre per annum, while the difference in the value of produce, even leaving out of consideration all the valuable products, is about *Rs.* 14 per acre. But when to this is added, that by means of these works the district is brought into the condition of an almost unlimited field for produce for the European market, in sugar, rice, cotton, oilseed, &c. (already in the last year there is a foreign export trade of 11 lacs), the results of the works, if fully carried out, are really incalculable.

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10. I must again and again insist upon this point; it is the foundation of all my conclusions, and unless it is kept in view no correct conclusions can be arrived at. I have not yet seen one word in any document connected with these works about the receipts, or the loss of receipts by not executing the works. One would suppose that all had hitherto been expenditure, and was to continue so for some years longer. But, in the present case, every rupee retained in the treasury instead of being a gain is an immediate loss. If three lacs are granted for the works this year I will answer for it that that amount is in the treasury again before the 12 months are over, before the whole of it is expended; that is, if the works are stopped the treasury will certainly be poorer when the accounts are made up at the end of the year than if they are executed, instead of being richer, besides a much greater loss to the people.

11. I cannot say less than this on the subject; it only seems extraordinary to me, after the astonishing progress the district has made in revenue, in exports, and in everything which indicates prosperity, that it should be necessary for me to say anything. We have thus now actually before us, as a thing already accomplished, the change from a torpid, indifferent economical system of management, to an active, vigorous, intelligent, liberal system, and we see the results; an expenditure of 12 lacs, and an increase of collections of 20 lacs, in the first six years of the change; and yet it is still said that money cannot be found for public improvements; and no doubt while the vast expenditure of 12 lacs is continually thought of and dwelt upon, not a word will be said about the 20 lacs received.

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13. I append to this, three short statements, as indisputable proofs of the soundness of the ground taken up in this view of the case: No. 1. The total collections of the district: No. 2. The increase of revenue in the tract first reached by the water: and, No. 3. The exports by sea from the district for a series of years.

No. 1.

STATEMENT showing the Collections, the Expenditure on Irrigation Works, and the Clear Revenue, in the District of *Rajahmundry*, for a Series of Years.

YEARS.	Total Collections.	Increase above the Average of the 11 Years before the Annicut Works were begun.	Outlay on Irrigation Works.	Net Revenue, after deducting the Outlay on Irrigation Works.	Increase of Net Revenue above the Average, prior to the Annicut Works, after deducting the Outlay on them.	REMARKS.
	Rs.	*Rs.*	*Rs.*	*Rs.*	*Rs.*	
1835–36 - -	19,83,888	- - -	5,654	19,78,234		
1836–37 - -	21,43,769	- - -	9,017	21,34,752		
1837–38 - -	19,94,614	- - -	5,948	19,88,666		
1838–39 - -	15,54,148	- - -	16,917	15,37,231		
1839–40 - -	17,13,201	- - -	19,772	16,93,429		
1840–41 - -	16,83,767	- - -	40,833	16,42,934		
1841–42 - -	19,23,702	- - -	17,166	19,06,536		
1842–43 - -	18,77,745	- - -	12,258	18,65,487		
1843–44 - -	19,86,148	- - -	37,858	19,48,290		
1844–45 - -	20,37,358	- - -	34,187	20,03,171		
1845–46 - -	20,91,085	- - -	44,734	20,46,351		
Average of 11 Years	19,08,129	- - - -	22,213	18,85,916		
1846–47 - -	22,19,098	3,10,969	2,44,182	19,74,916	66,787	* A year of unprecedented flood in the Godavery, by which fully a lac of rupees of revenue was lost. † Estimated.
1847–48 - -	22,73,485	3,65,356	3,45,561	19,27,924	19,795	
1848–49 - -	23,18,180	4,10,051	2,20,611	20,97,569	1,89,440	
1849–50 - -	*22,02,984	2,94,855	2,55,067	19,47,917	39,788	
1850–51 - -	24,81,700	5,73,571	†2,00,000	22,81,700	3,73,571	
Total Increase -	- -	19,54,802	- - -	- - -	6,89,381	
Estimate for 1851–52 *Rs.*	25,50,000					

No. 2.

STATEMENT of the Cost of Improving the *Samulcottah* Channel, in the *Rajahmundry* District, and of the Increase of Revenue so obtained.

YEARS.	Collections in the 10 Villages watered by the Channel.	Increase of Revenue in each Year above the Average before the Channel was dug.	Total Increase up to the End of each Year.	Outlay on the Work in each Year.	Total Cost up to the End of each Year.	Balance against Government up to the End of each Year.	Net Profit to Government at the end of each Year, after deducting the Cost of the Work.
	Rs.	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*
1840 -	20,846						
1841 -	31,158						
Before cutting 1842 -	22,580						
the channel 1843 -	26,936						
1844 -	28,385						
1845 -	21,775						
Average of the 6 years -	25,280						
1846 -	30,486	5,206	5,206	13,472	13,472	8,266	—
1847 -	36,093	10,813	16,019	8,465	21,937	5,918	—
After cutting 1848 -	42,940	17,660	33,679	3,686	25,623	- -	8,056
the channel 1849 -	47,910	22,630	56,309	1,580	27,203	- -	29,106
1850 -	51,245	25,965	82,274	2,023	29,226	- -	53,048

Note.—The average annual profit, from the very first year that the improvement was commenced, has been 56 per cent. on the whole outlay, and the revenue is still increasing.

No. 3

No. 3.

Statement showing the Value of Goods Exported by Sea from the District of *Rajahmundry*, from the Year 1843–44 to 1850–51.

YEAR.	1843-44.	1844-45.	1845-46.	1846-47.	1847-48.	1848-49.	1849-50.	1850-51.
Value of Produce Exported - -	*Rs.* 6,33,991	*Rs.* 7,29,287	*Rs.* 9,06,554	*Rs.* 13,53,503	*Rs.* 10,95,397	*Rs.* 10,56,727	*Rs.* 9,76,719	*Rs.* 13,96,226

(signed) *A. Cotton*, Lieut.-Colonel,
Civil Engineer, First Division.

Appendix (E.)

Reply of Lieut.-Colonel *A. Cotton* to a Query circulated to the Civil Engineers by the Public Works Commissioners, respecting the Roads in their Divisions. Appendix (E.)

There is a very small extent of road in this division that is in a practicable state in the monsoon, a very large part of the Great Northern Road is quite impassable in wet weather. Most of it neither metalled, nor bridged, nor drained; and in the deltas the roads are in the same state; indeed they are not in general even marked out for bandies; so that there is scarcely any bandy traffic even in the dry season. Twice I have been able to average only a mile an hour in a palanquin; on the Great Northern Road I have known a gentleman take four hours to travel seven miles on horseback. The Superintendent of roads has applied to me several times about the roads, but I have not been able to do anything that he required. Nothing to signify has been done of late, except the building of some small bridges.

But, perhaps, I may here properly enter upon this subject of the roads, in connexion with our present works more particularly. The Great Northern Road lies directly on the line of the high level channels from the two annicuts for more than 200 miles; and as these works must be executed for irrigation purposes, and when executed they must be incomparably superior lines of communication to the best common roads, it seems quite out of the question at this moment to waste money on the latter. To make these channels thoroughly complete for navigation, they will certainly require more money to be expended on them than would be necessary for the irrigation alone, but half or a quarter of what would be required to make the Northern Road practicable all the year, if added to the sum necessary for irrigation, would make such canals as would undoubtedly be the most suitable communications for this country; far superior to railroads, which would entail a permanent high rate of transit that could never be got rid of; for the mere interest of the money would cause a much higher tax on transit than the working expense and interest together on the canals. I was in hopes we should this year have had some good data for the cost of canal transit from one of our delta channels, but we have not been able, while the work was going on at the annicut, to keep a sufficient depth of water in it, to make it fully available for the common boats. At present it is worked by boats against the stream, at seven pice per ton per mile, but they are not more than one-third loaded, and greatly retarded by grounding; I should think they will certainly be worked at three pice per ton per mile, and at two pice when suitable boats are built, and the canals are complete with towing-paths, &c. Our 20-horse steamer is worked at about 1½ anna per mile, the cost of less than one ton of goods on the common roads and a little private steamer capable of carrying 20 or 25 passengers at four miles an hour, costs less than one anna a mile; showing sufficiently at what exceedingly low rates all the ordinary heavy goods and slow passenger-traffic could be carried on such canals; and for the few quick travellers a very good speed might be used, still at a very low rate.

This material advantage also would be gained, that, whatever the amount of traffic, very little increase of wear and tear would be occasioned. The channel already cut from the Tooliah Bagah, one of the annicut channels, to Samulcottah, 27 miles, has cost about *Rs.* 1,000 a mile; 1,000 more would make it a navigable channel of 15 yards broad. Its breadth is now eight at its head, and five at its end, with a fall of half an inch per mile, so that it might at any time be rendered a simple still-water canal, by closing the calingulahs, thus providing against a scanty supply of water. The rest of this line of canal would cost on an average rather more; but if the whole cost *Rs.* 3,000 a mile, it would be a mere trifle for such a line of communication, combining irrigation also. Ordinary travellers could be conveyed at one pice a mile, and one anna per mile would provide for a very good speed; such navigation would of course be incomparably superior to any canal navigation in England, nor could any river navigation compare with it. I would give them a fall of half an inch per mile, and have a depth of six feet at the upper end, and four at the lower, when the greatest extent of irrigation was going on, so that in a channel of 50 miles there would then be a surface fall of one inch per mile, which would give a current at the head of about

Appendix (E.)

800 yards per hour, and with a section at the head of 40 square yards, it would convey 32,000 cubic yards per hour, or sufficient for 32,000 acres in the monsoon. I am now preparing the estimate for the high level channel, from here to Ellore, 50 miles, and I think it highly desirable to widen the Samulcottah channel, and extend it 30 miles. It is evident that with such a communication running parallel to it, there could be no traffic on the common road worth making it practicable for.

I consider this question of the construction of canals for navigation one of the most important on the subject of public works in India at this time. For the last few years there has been such a general frenzy on the subject of railroads, that people in general have been quite incapable of patiently investigating the comparative results of railroads, canals and common roads; the first moment of the subsiding of this ferment should be seized to examine this matter thoroughly. This project forces upon us an inquiry into it; we must now decide whether while we are constructing a canal for 240 miles parallel to the Great Northern Road, it is advisable to lay out money in forming an effective road. I may here state my own conclusions on this point; they are, 1st, that in India, under the actually existing circumstances (and looking forward for a long time), wherever the surface of the country is such as to admit of an effective steamboat canal being cut within certain limits of cost, there can be no question whatever between a canal and railroad; and, 2d, that where, as is generally the case, irrigation can be combined with navigation, the advantage is much more in favour of the canal. As to constructing a railroad at *Rs.* 70,000 a mile, while the great Ganges Canal can be executed for *Rs.* 20,000, no greater mistake can possibly be made. If that work is opened in 1852, as expected, it will soon be seen that for Indian communication there can be no doubt about its superiority to a railroad; at all events, nothing in the way of railroads, and comparatively little in the way of common roads, should be expended till the grand experiment is tried. The question will not here be in general between canals on the English plan, unfit for steam-draught, and double railroads of the most perfect kind, but between steamboat canals and comparatively imperfect railways, and that in a country where every drop of water stored and distributed, is of importance.

Of the 480 miles from Madras to near Vizagapatam, 240 miles of canal must be constructed in connexion with the Kistnah and Godavery project; and if *Rs.* 1,500 per mile are expended on this beyond what the irrigation would require, and the same sum per mile for the remaining distance to Madras, in all seven lacs (not near so much as a good common road would cost), there would be a water communication connecting the whole basins of the Kistnah and Godavery with Madras, capable of being worked at 15 or 20 miles an hour by fast steamers, and at about two pice, or one farthing, per ton per mile for goods; no railroad, whatever the traffic or whatever the construction, could effect the latter. The mere draught on an imperfect railway, and the mere interest of money on a good one, would far exceed the whole cost of transit on a canal, including both draught and interest. Wherever a railway is constructed on a line suited for a canal, that part of the country will be closed perhaps for ever against cheap transit, and an irreparable mischief will have been done; and wherever a good common road is constructed in such a situation, there will have been just so much waste of money as it cost. There are already evident symptoms of men, who are not actually committed on this subject, again becoming capable of exercising their judgment upon it; and I have not the least doubt that shortly it will be discussed with some degree of impartiality.

Appendix (F.)

Appendix (F.)

REPLY of Lieut.-Colonel *A. Cotton*, Civil Engineer, in the First or Northern Division, to the following Circular Query from the Public Works Commissioners.

"HAVE you sufficient assistance, whether 'Officers,' 'Surveyors' or 'Overseers,' to enable you to do your work in all its parts, thoroughly; and if not, what addition of strength in each grade do you wish for?"

REPLY.—Next to the utter inadequacy of the department to the duties belonging to it, I consider the grand mistake is, the want of a due proportion of the subordinate grades. The old idea was, that if you could make an officer copy his own plans and diaries, you gained the *Rs.* 30 a month that a Writer or Draughtsman must be paid; but the palpable absurdity and waste of having the work of a man on *Rs.* 30 a month, done by one on *Rs.* 300, is now pretty well acknowledged in words, though by no means so in practice. So much is this the case in the Tank Department, as to offer a most encouraging view of a great improvement at a comparatively small expense: probably, the work performed by the department may be at least doubled, without any addition to the costly appointments.

Para. 2. The officers have nothing like the number of subordinates that they could direct; every officer ought to have at least one Surveyor, two Overseers, a Maistry, a Writer and a Draughtsman. The latter class is entirely wanting; so that a Surveyor, and very often an officer, is wasting his time in copying plans of sluices or calingulas, which could be done by a native on *Rs.* 20 or *Rs.* 30. If a division consisted of three districts, there might be one Civil Engineer, three Assistants of experience, and three younger ones; there would then be at least two Surveyors and four Overseers in each district. It should, however, be observed, that

that the number of Surveyors and Overseers would necessarily be very different in different districts, even if the same extent of work were going on, because native agency might be obtained to so much greater extent in some than in others. In this district, I have been entirely disappointed in my expectations of the effect of the annicut works in raising up native Maistries and Superintendents. We have now only three superior natives, and they have all come from other districts; excepting them, we have scarcely a native whom we could trust with the most insignificant work. In this respect, these districts are far behind the southern ones, no doubt in a great measure owing to the want of public works; but is not this want also an indication of the want of engineering qualifications in the Teloogoo people?

3. Upon the whole, I have nothing like sufficient assistants of any kind; I have not even near enough to carry out the Godavery project with energy; not half the work has been done this year that ought to have been done. For want of subordinates of all grades, but especially Overseers and Surveyors, a vast deal of work that should have been done by them, has been done by officers; and besides this work, I have had most urgent requisitions for officers from everybody who could officially call upon me for them. The three Collectors, the Sub-collector, the Superintendent of Roads, the Commander-in-Chief, through the Government, and the Commissioner, have all pointed out work most necessary to be done; and now also the Kistnah annicut, though ordered to be executed, is not undertaken, I suppose because it is considered that there are no officers to build it. Every one of these requisitions were reasonable ones: many of them showed how thousands of rupees were lost annually from want of some comparatively trifling works or repairs; but the treasury cannot bear such an expenditure on the public works, yet it can bear the loss of ten times the amount in deficiency of revenue.

4. The strength of the department that I should recommend in this division, if the whole three districts are continued under one charge, for the next six years, is as follows:—

1 Civil Engineer.
1 Experienced Assistant in Rajahmundry.
1 - - Ditto - - in Masulipatam.
1 - - Ditto - - in Guntoor.
1 - - Ditto - - in charge of the Kistnah Annicut.
3 Assistants in the three Districts, for the Ordinary Works.
9 - - Ditto - ditto - - for the New Works.
2 Non-commissioned Officers or Surveyors to every officer.

Also the usual establishment, with the addition of a Draughtsman to each officer.

The expenditure remaining for the works in this district is probably about six lacs, and the Kistnah works are estimated at 15 lacs, which would give three-and-a-half lacs a year for six years, besides the current expenditure, which ought to be two lacs more per annum. There would then be 51 Europeans to an expenditure of five-and-a-half lacs per annum, or one to every *Rs.* 11,000; including those employed in surveying and levelling, and those who would be absent on various causes.

5. This would cost about *Rs.* 1,20,000 a year, or an addition of 20 per cent. upon the outlay; and I feel confident that this amount of superintendence is necessary for the careful planning and executing of these works. We have had nine officers, four Surveyors, and about seven non-commissioned officers, since the annicut works have been going on; but then the whole of the ordinary works have been neglected, excepting that one officer and one Surveyor have been stationed in Guntoor. But this is not economy, but waste. When the Kistnah works are taken in hand, we ought to have about six officers and 12 non-commissioned officers or Surveyors employed upon them, about the same number upon the Godavery new works, and at least three or four officers for the other works of the division.

6. I should, however, particularly mention that, in my opinion, the non-commissioned officers, if properly managed, will be so useful as to allow of the number of officers being diminished. From what I have seen of this class, I have no doubt that there will be real economy in employing them, as they will do much of the work that is now performed by officers; and I look forward to the time when a proportion of one officer to four or five non-commissioned officers, will be sufficient, if a regularly-graduated service is formed from that class, from Conductors downwards, and something like fairness is shown in promoting them. I would also most strongly recommend that no appointment should be withheld from any man who shows himself fit for it; there is no reason in the world why men of first-rate engineering talents and qualifications may not come out of that class as well as out of a higher.

7. I cannot conclude the answer to this question without urging a full consideration of this most important point. When an increase of the department is mentioned, the question is usually settled by a reference to what has been customary hitherto; that is, if three officers have been employed before, it may be thought that an addition of one or two more must be ample, without the slightest reference to anything which can by possibility help us to judge rightly in the matter. When I first entered the department, there were three officers in the divisions and one at Madras, to perform all the duties of the Tank and Road Departments, about five or six Surveyors, and no subordinate Europeans; when more help was called for, one was appointed in some particular case, and so on; it was an increase, but whether it was what the duties really required or not was never investigated upon any real grounds. Had any one then proposed that 30 officers should be employed, besides many non-commissioned

Appendix (F.)

officers, which I believe is about the present strength of the two departments, it would have been considered absurd, simply because it was so much more than there were before. With this number, it is now evident that we are almost as far from such a number as could properly perform the duties, that is, as could with strict economy be employed, as we were 30 years ago, for the increase is only a small part of what the irrigation works and roads require.

8. The question is not at all how many have been employed hitherto, but how many do the works require; so far from the paucity of officers and smallness of expenditure being an argument for a small increase, it is in fact usually just the contrary. The superintendence and expenditure having been so utterly inadequate for so many years, has thrown everything into arrears, and much more is in consequence required. When the question of the establishment for these districts was discussed some years ago, it was settled upon the ground that *Rs.* 6,000 or *Rs.* 8,000 had been usually expended in each district; that is, that all the works had been left to go to ruin ever since they had been under our Government. In my report to the Board, dated 13th December 1837, published in the Engineer Transactions,* I endeavoured to establish some real grounds for ascertaining what establishment and expenditure were necessary, by showing the amount of revenue at that time received from irrigation works, the probable cost of existing works, the revenue that they would yield if kept in order, &c. Till some tolerably correct statements are prepared on these points, and a judgment based upon them as to the proper strength of the department in general, or in any particular district is formed, it is all mere guess work.

9. In this division there is scarcely a single work that is in a respectable state, and almost the whole of them are without proper sluices, calingulas, &c. &c., so as to ensure their safety or efficiency. There are numbers of individual villages that would much more than pay for an officer to be permanently appointed to their sole charge. One of the villages under the Samulcotta Channel, Biccavole, is now yielding *Rs.* 6,200 a year more than before the water was led to it, and it is not yet by any means properly watered or drained, for want of some small works. Were it necessary therefore to appoint an officer on *Rs.* 246 a month (salary and establishment) to this one village permanently, it would have been better economy than to have left it in its former state, as there would still have been a gain of *Rs.* 3,000 a year, which would have covered a very large outlay on the works required. The grand question is, what is lost, wantonly wasted, squandered in revenue, much more than in expenditure? The whole cost of the Tank Department is a trifle compared to the waste of revenue, even leaving out of consideration altogether the wealth and safety of the people.

10. The present works in this district have been now on hand four years, and yet very little has been done for the distribution of the water. I cannot see what has been gained by this loss of time; the channels, &c. might just as well have been going on while the annicut was building; as soon as it was across the river the water ought to have been turned into all the main channels. The delay of these works is only the delay of receipts; several lacs more might already have been received into the treasury, had officers been allowed sufficient to have planned and superintended the minor works during the last three years. It cannot be said, as it is continually said or implied, that the treasury could not supply the money so rapidly, for the actual increase of receipts of the districts has far exceeded the expenditure from the first; instead of the works having drawn out Government money, there has all the time been a larger surplus revenue than there was before.

11. There can therefore be no reason whatever for not increasing the strength of the department so as to allow of the main and minor works all going on together, as well as the repair, or rather the restoration or completion of the old works above the Deltas. The great difficulty is to get persons to look at things as they really are here; irrigation works are considered as things for which the Government must be content to lay down a large sum at first, with the hopes of receiving, after a few years, 10 per cent. if they are very successful; whereas the results in this division show, that such is the state of things, viz., the value of water, and the want of capital among the people, that much more than the sum expended returns directly and indirectly into the treasury immediately.

12. With respect to the question, supposing such an amount of expenditure is allowed, what proportion of superintendence may be required for it,—20, 40 or 60 per cent. upon the outlay; I answer that it may be anything; it entirely depends upon the peculiar circumstances of the district, and the work. The cost of planning works, for instance, is often in inverse proportion to the cost of the works; a young man may take a month to plan a work to cost *Rs.* 5,000, and his salary during that time may be *Rs.* 300, or six per cent.; a man of more experience may see that the same end can be more effectually obtained by a different kind of work, which will cost *Rs.* 1,000, and the planning may then cost *Rs.* 500, or 50 per cent.; but there will still have been a saving of *Rs.* 3,800. The waste of money from what is called economical superintendence in this country is incalculable; the loss to the Government from ignorant planning, and slovenly, indifferent and fraudulent execution, is ten times what the cost of good superintendence would be.

13. In this division I am really in despair about native superintendence. Such has been the corrupt state of things here in the whole Revenue Department, and such is the apparent unfitness

* *See* Appendix (B.)

unfitness of the natives generally for the conduct of engineering works, that for the present I can see no alternative but to use almost exclusively Europeans, with natives only in very subordinate capacities, and under incessant watching. We have indeed a most valuable native Superintendent, but he has come from the southward; no doubt by degrees a native agency may be raised up, but it can only be by means of European instructors. Appendix (F.)

Appendix (G.)

Appendix (G.)

EXTRACT from a Letter from the Board of Revenue in the Public Works Department to the Chief Secretary to Government, on the subject of Improvements required in the Department, dated 15 February 1847.

20. THE Honourable Court proceed to observe, that "measures are being taken for supplying an additional number of Engineer Officers, so that the Government may be enabled at all times to have at least two Engineer Officers in each of the eight divisions."

21. The Board have frequently expressed to Government their opinion of the great necessity of keeping a sufficient number of Engineer Officers in employment in this department, and they now observe that it is still short of the minimum stated by the Honourable Court, and more so of what is really required.

22. The First Division has two Engineer Officers, neither of whom, or of the extra Assistants from the Line, recently appointed, can be employed out of Rajahmundry, in consequence of the paramount importance of that district, which will require even more attention should the Godavery anicut be sanctioned; it will in that case be indispensably necessary to constitute Vizagapatam and Ganjam a separate charge, and two Engineers there, with three in Rajahmundry, are the least number that would be required for the real interests of Government.

23. In the Second Division there is now but one Engineer Officer, and two more are required.

24. The vast extent of the Third Division or Ceded Districts (containing more ground than Scotland), and the difficulties of the communications, make it a most onerous charge for one officer, who can never attend to it properly, so as to propose the extensive measures of improvement which the irrigation requires. In Bellary, indeed, the works have been kept in excellent order, chiefly by means of the exertions of the late Mr. Robertson, but beyond that nothing has ever been attempted; and yet there is no district where the uncertainty of the rains requires such careful attention to make the most of the great sources of supply. In Cuddapah, the maintenance of the existing works even has not been effected, and the mischievous results of inadequate expenditure are everywhere seen.

25. Since 1838, when the present divisions were formed, there has never been more than one Engineer in this division, and Kurnool is since added to the Company's territory, having such a geographical position that it must either be attached to the Third Division, or made a separate charge; it is at present under the officer employed in constructing the Bellary barracks, but when these buildings are finished, it will be highly desirable to constitute Bellary and Kurnool one charge, and Cuddapah another; for this arrangement five officers would be required, or three in excess of the present number.

In the Fourth Division a first Assistant is required.
In the Fifth a second Assistant.
In the Sixth a first Assistant.
In the Seventh a first and second Assistant.
The ghauts in this division requiring more constant attention from officers than most other works.
In the Eighth, two Assistants; besides one for the work in Travancore.

26. It thus appears, that in addition to those now employed, there are required—

In No. 1 Division - - - - - - - -	3 officers.
In No. 2 Division - - - - - - - -	2 officers.
In No. 3 Division - - - - - - - -	3 officers.
In No. 4 Division - - - - - - - -	1 officer.
In No. 5 Division - - - - - - - -	1 officer.
In No. 6 Division - - - - - - - -	1 officer.
In No. 7 Division - - - - - - - -	2 officers.
In No. 8 Division - - - - - - - -	3 officers.
Total - - -	16 officers.

27. Three have been already nominated to the department from the Sappers and Miners, but are not yet appointed to divisions; 13 are therefore still required. And it should be observed that these are not more than sufficient for the ordinary duties of the department.

Appendix (G.)

For the special superintendence of large works others are required, but if the number above-mentioned were always kept complete, as a matter of course the want of a reserve for special duties would be less felt. Hitherto no sooner has an Assistant been appointed to a division, than he has been called off from ordinary to special duties, and the department has gained no real increase of strength; but were there always two Assistants in a division, one might be spared for extra superintendence without much inconvenience.

28. In addition, however, to the officers required for the present duties of the divisions, it appears to the Board very necessary to represent to Government that some should be specially appointed for a time, to investigate the means of perfecting and extending the irrigation from the great rivers, such as the Poniar, Pennar, and Palar, which now for the most part run to waste.

29. The Board do not doubt that the result of such investigations, ably conducted, would eventually amply repay any expense incurred, whether on their account or in the works based thereupon.

30. For it certainly is not sufficient that the present works of irrigation should alone be maintained. The greatest part of them are precariously situated for supply, and being consequently dependent for their efficiency upon favourable seasons, are of little avail in averting periodical famines. By supplying such works from the great rivers to such extent as may be practicable, there can be no doubt that great advantages would be gained; but the difficulties of diverting the waters of the rivers for the purpose, are such as can be overcome only by the patient investigation of qualified officers, withdrawn from all other duty.

31. The Board, therefore, trust, that a sufficient provision of officers may be made both for the permanent duties of the divisions, and for those which have been above briefly indicated, and which, though described as temporary, would occupy many years to bring to a satisfactory conclusion. Four officers would probably be sufficient for the purpose in view, and the additional number therefore required would, including those four, be 20.

32. While upon the subject of the officers attached to the department, the Board would observe, that it appears to them very desirable that an increase of pay should be allowed to the First Assistants, after a certain length of service.

33. Captains Shaw and Smythe, the senior two First Assistants, have been each 19 years in the service; and yet their salaries, had they not temporary employment of a superior kind, would be no more respectively than that of the youngest of the same class, whose service extends to four years only.

34. In proposing an alteration of the existing system, the Board considering that the Engineer Officers are available for all kinds of professional duty, civil and military, would annex the privilege of increased salary to simple length of service, without reference to any period of employment in the department; they are persuaded that it would be impracticable to introduce any limit that would prove either fair or useful.

35. The increase which the Board consider to be necessary is *Rs.* 100 to officers of 10 years' actual service, to make their salaries *Rs.* 500, and *Rs.* 50 additional to those of 15 years' service and upwards, with one rupee per diem additional tent allowance.

* * * * * *
* * * * * *

63. The Board proceed to report upon one of the most important branches of the department, namely, that of native superintendence, which it must be allowed is at present in a most inefficient and unsatisfactory state, with no hope of amendment unless the system be changed.

64. The principal faults of the system are the want of any preparatory education, and the want of sufficient inducement in the form of emolument. These points, with others, are forcibly urged in a letter from Major H. C. Cotton (since retired), which the Board now submit for the consideration of Government.* Five years have passed since that officer wrote, and the lamentable want at this moment of good Maistries, notwithstanding the experience acquired in many important works, clearly proves that they cannot be produced (except in a few rare cases of superior intelligence) by the existing system. The mass can never overcome their original ignorance. Experience may be said to be thrown away upon them, because they have no comprehension of the processes which they witness, and in which they take a part.

65. It should be here observed that the want of good superintendence for the more important works, under the immediate direction of the Civil Engineers, will be met by the appointment of European Overseers in sufficient numbers. But the great mass of works must always be left to the native Maistries, and consequently even more require that they should be skilful persons, since they are comparatively without control. And were there no such pressing reasons for improving their efficiency, it would be anything but politic or just to continue for ever dependent upon European agency in this department, when, in every other, better prospects are opening to the natives of the country.

66. The

* *See* Appendix (I.)

Appendix (G.)

66. The Board, however, are not prepared to recommend the full extent of Major H. C. Cotton's propositions. They do think it necessary to fix (for the present at least) the salaries of particular offices (as those of the Maraumut Superintendents of different districts) all at the same amount. It will be sufficient at first to establish a maximum salary for Maistries in the same manner as for Surveyors, and to hold out to every Maistry the prospect of attaining to that degree of emolument by different stages, after a certain length of service, and with a certain amount of qualification. No one should be promoted merely to fill a vacancy; but on the other hand there must be a limited number of salaries of each class, and when all are occupied no promotion should take place without a vacancy.

67. In the second place, since very few of the present Maistries are fit, or ever will be fit for promotion, it is of great importance that provision should be made for the education of future functionaries of this description by the enlistment of boys, of whom 20 should be entertained at *Rs.* 5 a month, and instructed at the Presidency in the first instance, according to a certain course to be hereafter determined.

68. The accompanying memorandum will explain in detail the arrangements which the Board would recommend with regard to the Maistry Department.

Note by the Public Works Commissioners.—The following is the scale of the Maistry Establishment proposed by the Board of Revenue, in the memorandum referred to in the 68th para. of the foregoing letter:—

CLASSES.	Monthly Salary.	Number of Maistries in each Class.	Total Monthly Salary.	Total Yearly Salary.
	Rs.	*Rs.*	*Rs.*	*Rs.*
1st Class, after twenty years' service - -	100	10	1,000	12,000
2d „ sixteen „ - - -	70	15	1,050	12,600
3d „ twelve „ - - -	50	20	1,000	12,000
4th „ eight „ - - -	35	25	875	10,500
5th „ four „ - - -	25	30	750	9,000
6th „ under four „ - - -	15	50	750	9,000
TOTAL - - -	295	150	5,425	65,100

A standard of qualifications to be fixed for each class, without which no man was to be promoted to it.

There was also to be an establishment at the Presidency, under the management of a practical teacher, on *Rs.* 50 a month, for training up boys as Maistries: 20 boys to be under instruction, receiving each *Rs.* 5 a month for the first two years, and *Rs.* 7 a month for the third year. Probably, therefore, a three years' course was intended; but this establishment was not to be considered permanent. The Maistries were to be removable from district to district, at the discretion of the Board.

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Appendix (H.)

LETTER from the Board of Revenue in the Public Works Department to the Secretary to Government, Fort St. George, respecting the Defects of the Department, and the best Means of removing them, dated 30 July 1849.

1. I AM directed by the Board of Revenue, with reference to the Government orders as per margin, to submit the returns called for by the Government of India, of the Engineer establishments and operations for the period of five years, from 1842 to 1846, with observations on the means of promoting greater efficiency in the Department of Public Works, both in its superior and subordinate branches.

11 May 1847,
23 November 1848,
2 January 1849.

2. Besides the returns for five years, the Board have prepared one of the establishment as it now stands, there having been a considerable increase in the number of officers and subordinates since 1846.

	Engineer Officers.	Other Officers.	Uncovenanted.	Non-commissioned.	TOTAL.
3. The average of the five years period gives - - - - - - -	16 3/5	6	22 1/5	- -	44 4/5
And those now on the establishment, including absentees, are - - -	25	8	24	29	86
Increase - - - -	8 2/5	2	1 4/5	29	41 1/5

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4. In the order dated 23 November 1848, the Government direct the Board to "again consider the arrangements proposed by them for improving the efficiency of the Department of Public Works, and to prepare and submit, in a concise and connected form, a report of the measures admitting of immediate adoption for the object in view, which they would now recommend, &c."

5. The letter of the Government of India, however, calls for a statement of the "improvements or alterations of which the present distribution [of Engineers] is susceptible, with a view to show how far the complement of Engineers is sufficient or insufficient for the departmental duties now required to be performed."

6. It will therefore be the duty of the Board to report the arrangements that seem to them expedient, either with or without the condition of an increase of Engineer officers.

7. At the date of the Board's Report of the 15th February 1847, which was submitted to the Honourable Court of Directors, and is referred to in their general letter, dated 31 May 1848, No. 12, the number of Engineer officers in this department was,—

1 Secretary to the Board of Revenue.	
8 Civil Engineers.	
6 First Assistant ditto.	
3 Second Assistant ditto.	
Total - -	18

Para. 26 and 31.

And the Board were then of opinion that 16 more were required for general and four for special duties.

8. The actual increase up to this time has been seven, and this has been obtained only through the addition of four supernumerary Second Lieutenants to the corps of Engineers, and to the presence of an unusual number of officers in India. The only two absentees above the rank of regimental Lieutenant, being within the limits of the Charter, are holders of appointments in the department, and are included in the return; while there are but five subalterns absent in Europe out of 34.

9. If all the officers were present, only five more, instead of 13, the number remaining of these applied for in 1847, could be added to the department; and only one, were there no supernumerary Second Lieutenants.

10. The Board are consequently unable to recommend any arrangements for "immediate adoption," with regard to the distribution of the officers of the department; the want of officers absolutely precluding any new arrangements such as they would consider expedient. But their opinion is unchanged that an increase of officers is urgently necessary; and, in the hope that it will be granted by the Court of Directors, they proceed to discuss the requisite arrangements for the disposition of the number which they would deem adequate.

11. The disposition existing in February 1847 was altered in October of the same year by a different arrangement of the divisions, and by the constitution of Vizagapatam and Ganjam, a separate charge under a First Assistant Civil Engineer.

12. At the present moment there are,—

In the Sub-division - - - - -	1 officer.
In the First Division - - - - -	5 officers.
In the Second Division - - - -	1 officer.
In the Third Division - - - - -	2 officers.
In the Fourth Division - - - -	1 officer.
In the Fifth Division - - - - -	2 officers.
In the Sixth Division - - - - -	3 officers.
In the Seventh Division - - - -	2 officers.
In the Eighth Division - - - -	2 officers.
Total - - - -	19 doing duty.

13. Of the remaining six included in the return, one is the Secretary of this department, two are sick absent beyond the Presidency, one sick absent within its limits, one is employed under the Superintendent of Maraumut in Mysore, and one under the Military Board, giving also a partial attention to the Kurnool District.

14. If all the provincial officers on the roll were distributed equally among the divisions, exclusive of Vizagapatam, Ganjam and Kurnool, there would be just three for each, the least number that the Board would consider sufficient as a permanent establishment; and it is abundantly evident that such a number can never be permanently reckoned upon in the present state of the Engineer corps. It may safely be averred that, with allowance for extra duties and for furloughs, the number will be usually below rather than above that which is now in actual employment, namely 19, which would give two for each division, with a remainder for Vizagapatam, Ganjam and Kurnool.

15. It appears to the Board necessary, that whatever general appointments there are in the department should be always filled, according to the practice which prevails in every other

other department of the public service, but which has never prevailed in this, because the qualified officers are too few.

16. During the China and Sinde wars, there was not a single Assistant Civil Engineer doing duty in the department for months together, and an officer of the Line, possessing no professional qualifications, was even in charge of one of the divisions. There is no certainty that the same state of things will not occur again; but leaving out of consideration foreign expeditions, the demands for special service at home are quite sufficient, if supplied by professional officers, to disarrange the general duties of the department to an equal extent.

17. Yet the general duties in this Presidency are far more important than is commonly supposed, or can be well understood by those who are not familiar with a country thickly studded with tanks or interlaced with channels, all requiring to be kept in efficient repair, and all sure to be neglected by the natives or to become objects for practising the grossest frauds upon the Government, without the vigilant care and attention of European officers. A revenue of no less than 132 lacs of rupees (exclusive of that of the Northern Circars, which cannot be distinctly shown, and of village settlements), is directly dependent upon these works, besides which the numerous roads should be taken into consideration.

18. That very great effect may be produced by such care and attention the Board have not the least doubt; that it has already been produced in some instances there are proofs, which they will briefly notice.

19. In the Bellary district, it is well known that the late Mr. Robertson occupied himself to an extraordinary degree in personal visitation of the tanks and superintendence of the repairs; and it is certain, from the testimony of Engineers acquainted with that and other districts, that the superior condition of the Bellary Tanks is most marked and decided.* What it was at an earlier period may be learned from Sir Thomas Monro's report of the enormous losses caused by 48 hours rain in 1804.

20. Since that period, doubtless much has been done in other districts also, but there are none in which the results are to be compared with those of Mr. Robertson's labours; and in Chingleput alone 600 tanks were breached or greatly damaged in the monsoon of 1846.

21. In the Eighth Division the Civil Engineer, Captain Horsley, having seldom had large works requiring his attention, has been able to devote more than most other officers to the visitation and superintendence of the tanks, and the results of his labours are stated in the last two paras. of the accompanying letter. He attributes his success principally to the system of estimating and measuring introduced by him; but the Board believe that the system, however good in itself, has derived its chief virtue from being worked to a considerable extent by the Civil Engineer in person. 20 December 1848.

22. It being granted, therefore, that the appointments to the general duties of the department ought to be all permanent, the Board are further of opinion that such permanent situations should include, besides the Civil Engineers, an officer for every collectorate, whose duty it should be to superintend the entire Maraumut of the district, under the general control of the Civil Engineer; and in offering this opinion, they would observe that they are following out those of the Honourable Court of Directors, expressed in despatches dated 28 October 1835 and 17 December 1833, in which it is stated that "they attach great importance to all works in the department being placed under the constant personal control of European officers, and that they hold it to be an unwise economy to commit the management of extensive and important works to native agents," and "that all operations of the Tank Department should be under the superintendence of officers perfectly qualified to conduct them, and to keep an effectual check on the disbursement of the large sums expended on this branch of the public service."

23. For this arrangement there would be required (inclusive of the present Civil Engineers) 28 or 29 officers, whose situations should be considered as permanent as those of Collectors and Sub-collectors, and to supply whose vacancies there should be always a sufficient reserve of Engineers. The special duties of the corps would furnish ample demand for the full amount of such a reserve, and every officer in the corps present for duty would be usefully and profitably employed.

24. Substituting for the eight infantry officers of the line, &c., now employed, an equal number of Engineers, the excess above the present supply required to give effect to the arrangement proposed by the Board would be, at the lowest, 17; but if a greater number of absentees be supposed (there being very few at present), and if allowance be made for other special services now not attended to, and those to which allusion is made in the last para. of the letter from the Government of India, an increase of 25 officers to the corps of Engineers would be no more than adequate to supply means for the efficient working of the department.

25. It is here necessary to explain, with reference to the former report, that the additional

* *Note by the Public Works Commissioners.*—There is no doubt that the irrigation works in Bellary District were much improved by the constant efforts of Mr. Robertson; but we believe it is admitted by all officers capable of judging, that the amount expended in effecting that improvement was very much larger than would have been found necessary under the direction of professionally skilled European officers.

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tional officers therein applied for were simply mentioned as Assistants to the Civil Engineers, and that the difference in the present proposition is, that such officers should be located in districts instead of divisions, being subject to the orders of the Civil Engineer, but permanently attached, with more responsible duties than they have at present, to their proper districts.

26. The difference in the numbers proposed arises from the circumstance that the present arrangement exhibits more distinctly the number which should be permanently employed under all circumstances.

27. Whatever increase the Honourable Court may think it proper to grant, the Board desire to repeat their opinion that no change in the present arrangements of the department can be beneficially introduced without a sufficient number of officers, including a proper reserve for the supply of the permanent situations which they have described.

28. It will be remembered that the Civil Engineers and their Assistants are required to attend to the works under the control of the Military Board, as well as to those of this department; and the more so that there are no executive officers under the immediate orders of that Board, who have lately brought strongly to notice the inconvenience of the system of entrusting the works to the Station Staff Officers.

29. There is no certain remedy for this state of things while the Civil Engineer's Department remains upon its actual footing; but the proposed District Engineers would be able to take direct charge of the military as well as civil works, with a prospect of great improvements in the execution of both. But to this the Board feel it right to add, that besides the eight officers of other branches of the service under the immediate orders, there are four under the Superintendent of Roads, one under the Chief Engineer at Paumbum, one under the Superintending Engineer at the Presidency, and one attached to the Sappers and Miners, but doing duty in this department at the Godavery annicut; total 15, not one of whom could be dispensed with.

30. There are also six other officers doing duty with the Sappers and Miners, the services of most of whom may be said to be equally indispensable; since there are never more than two or three of the youngest Engineer Officers, besides the Commandant and Adjutant, with that corps.

Superintendent of Roads - 4
Chief Engineer 1
Superintending Engineer Presidency - 1
Sappers and Miners, say- 5 or 6
11 or 12

31. The Board are constrained to notice these circumstances, extraneous as they appear to be to this department, because, if, as they have shown, there are fully 11 or 12 officers, not of Engineers, whose services are absolutely required in other branches of the public works at present, and if, as will be admitted, it is highly important to provide regularly educated officers for those branches, it will follow that about 37 additional officers should be added to the Engineer Corps, to ensure the constant supply of the permanent and extra situations.

32. It thus appears that the present strength of the Engineer Corps is far below the real wants of the country, and that the execution of the public works which are everywhere so urgently demanded cannot be provided for efficiently, if at all, without a large increase.

33. It is true that efficient assistance has been rendered in the Department of Public Works by non-professional officers; but it cannot be said that their employment as a system works well, having this serious disadvantage among others, which will be obvious, that the promotion of such officers to higher situations can only take place at the expense of the Engineers who have no other means of advancement; so that the former have little inducement to continue in the department if any better prospect is opened to them. With regard to qualification, whatever may have been acquired after a certain amount of service, very few examples of its previous existence in the officers selected to do duty in the department have come to the knowledge of the Board, and it may be fairly presumed that the service would supply but very few more.

34. Should the recommendations of the Board be adopted, they would lead in time to the establishment of a new executive system, in the hands of the District Engineers, with the prospect of most important advantages in the more efficient and economical performance of work, and in many other respects.

35. With regard to the execution of work, the Board have recently placed before Government the report of the Civil Engineer, Fifth Division, upon the Trivady annicut, showing in that work, which was virtually under the executive charge in all respects of his overseers, a saving of no less than *Rs.* 3,241. 8., upon an estimate of *Rs.* 16,081. 3. 5., or about 20 per cent.; a result which must not be understood to impeach the correctness of the estimate, the whole of which, in the opinion of the Civil Engineer, would have been expended under the ordinary system.

36. Again, nothing could be more unsatisfactory than the progress of the Trichinopoly bridge in 1847, and the state of the accounts, which subsequently required the investigation of a special officer; and, on the other hand, nothing can be more gratifying than the result of this year's arrangement, both in the rapid and efficient collection of the work, and in the moderate amount of the expenditure as reported by the Civil Engineer.

37. Captain Lawford has since taken charge, by permission of Government, of extensive road

road works, both in this and the Road Department; and it is believed, on good grounds (no official reports being at present before the Board), is carrying them forward with great expedition and economy.

38. The last example of this kind, which the Board will produce, is that of the formation of the Sattyamungalum ghaut, under the superintendence of Lieutenant Chauncey, of the 39th Regiment, reported upon by the Civil Engineer, Seventh Division, in his Diary for February 1849, herewith submitted.

39. The work of the ghaut, commenced by Lieutenant, now Captain Collyer, who was removed when small progress had been made, had, after a lamentable loss of life among the native officials of the district, been wholly suspended for two or three years, when Lieutenant Chauncey took charge of it, and by his excellent arrangements effected the results stated by the Civil Engineer.

40. This last example, and that of Mr. Robertson, the Collector of Bellary, are adduced to show the advantage of the constant and vigorous supervision of European officers, but without reference to professional qualification, which the Board consider to be an essentially necessary element of the system which they propose.

41. Such examples as these may be repeated under the present system, but not upon an extended scale, which is attainable only by the appointment of district officers.

42. Another important reason for such appointments is that the proper selection may be made of tanks and other works for repair, and that the estimates may be prepared with an accuracy now very generally made light of.

43. The Tahsildars and other Revenue Officers are too much occupied with their proper duties to attend (with some exceptions) to those of the Maraumut, with such regularity as would insure to Government the greatest advantages from the large expenditure which takes place; and hence repairs are neglected in some, and unnecessarily executed in other cases; the estimates are inaccurate, and the works are too long delayed, and, being entrusted to the Ryots themselves, are commenced too late, and inefficiently and fraudulently executed. It is also very difficult for Tahsildars to attend to the details of accounts, and to render them with the requisite punctuality in large and important works, and it is highly desirable that they should be relieved as far as regards these works from such duties as much as possible.

44. The only sufficient remedy appears to be the control of an Engineer Officer over the entire Maraumut of the district.

45. Were the district appointments which the Board have recommended, constituted, the pay of the officers holding them should be the same as that of the present First Assistant Civil Engineers, with the increase after 10 and 15 years' service proposed in the former report. And the Board would here again recommend, without reference to any increase of officers, that the said increase of emoluments may receive favourable consideration and sanction. 15 February 1847. Paras. 33 to 40.

46. The principle of such an increase is already partially recognized in the appointment of Superintending Engineer, which is paid according to the rank of the officer; but in this form it operates less as a reward for length of service and experience, than as a penalty upon slow promotion. There are at present 14 Subalterns of Engineers of 23 down to 15 years' standing, and it appears to the Board contrary to sound principle that all the professional knowledge and experience of such officers, who, according to the custom of the service, can only be employed in professional duties, should be reckoned at no higher value than that of some of the youngest in the corps, merely because they have attained no higher military rank. If the principle of payment according to length of service were objected to, it would probably be allowed that the district appointments should at least be arranged in classes; but the objection to this plan would be, that it would lead to constant changes of situation, and would cancel the advantages of local experience, which can scarcely be too highly estimated.

47. The Board therefore trust, that the scale of payment before recommended by them for the First Assistant Civil Engineers, namely, an increase of *Rs.* 100 after 10, and of *Rs.* 50, with one rupee a day additional tentage, after 15 years' service, may be approved for present adoption, with a view to its extension to whatever new system may hereafter be organized; the increase however to be dependent in each case upon the recommendation of the Board.

48. In the latter part of para. 2, of the letter from the Government of India, a request is made for "a conjectural outline of the demand for Engineer Officers during the next five years, whether any of the subordinates in the department are qualified for appointment to the smaller charges now held by officers, so as to render more extensively available the services of the Engineer Officers now at the disposal of Government for duties of greater importance, &c."

49. The answer to this inquiry is in considerable measure supplied by the remarks already offered upon the necessity for District Engineers.

50. The "Engineer operations of the next five years" will probably be much the same as those of any preceding period, and will continue to be the same for any length of time of which a judgment can be formed in advance. That is, the duty of constant attention to the exceedingly

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exceedingly numerous works of irrigation will always be of the highest importance to the interests of the State, independently of that of the superintendence of individual operations of considerable extent and cost. Regarding the probable frequency of such occasional undertakings, demanding the services of special officers, it is not easy to form conjectures; but should the Court of Directors be pleased to sanction the important project of the Kistnah annicut already submitted to Government, it will, with its dependent works, and those of the Godavery annicut now approaching to completion, demand a larger number of special officers for some years than any that has been employed during an equal period heretofore. Seven or eight officers, besides those properly belonging to the division, are the least number likely to be required, and the average operations of a special description in the other districts would certainly require the number to be increased to about 15.

51. As it has already been shown that there are not nearly enough Engineer Officers for the present duties of the department, it is almost superfluous to add that there are no appointments now held by them which might be more properly entrusted to subordinates. So little is this the case, that it is found in numerous instances expedient to appoint officers wanting both professional education and experience to the charge of works, rather than technically qualified subordinates, because of the superior influence and command obtained through the higher rank of the commissioned officer.

52. It is certain that no Engineer Officer can be withdrawn from his present duties without serious inconvenience, though the measure may be often unavoidable.

53. It is further asked by the Government of India in the same para., "whether any plan can be recommended, by the adoption of which the departmental officers generally would be relieved from the minor and more common details of their officers, which it is apprehended, under the present system, occupy much of the time that might be employed by them with greater advantage to the public service."

54. The Board are not of opinion that any new plan is required in this Presidency to remove the evil adverted to in the foregoing quotation. The Civil Engineers and their assistants are indeed often burdened with details of duty, particularly in their offices, which might be more economically performed by subordinate servants; but all that appears to be required is a moderate increase to the office establishments. A Draughtsman for each Civil Engineer is especially needed, and this addition the Board would recommend for sanction. Other arrangements of the kind must depend upon the view taken by superior authority of the Board's major propositions above detailed.

55. The next subject for consideration is that of the Subordinate Department, brought to notice by the officer commanding the Sappers and Miners, and the Adjutant-general of the army.

56. The military authorities are probably not aware that the present civil salaries, drawn by the non-commissioned officers of Sappers and Miners attached to this department, are only those of the junior rank; and that besides intermediate ranks undetermined, the salary of the highest has been already fixed by Government, in a resolution which was communicated to the Military Department.

57. The arrangement sanctioned in that resolution would give to the highest class of Overseer, called by the Superintendent of Roads "Supervisor," a total salary of *Rs.* 140, including the pay of a Conductor, to which warrant rank it is supposed that the Overseers of this class would be promoted.

M. C. 4 Aug. 1848, No. 836.

58. The order of Government for attaching the non-commissioned officers to this department not having appeared till January 1847, and the men not having generally joined their divisions till some time after, the Board, until lately, were of opinion that the longest period served by any of these men, scarcely entitled them to promotion; but they would have ere this submitted some names for the favourable consideration of Government, had they not been informed that a "measure" was "contemplated" by the Government of India, the effect of which would be to place the "Overseers and Assistant Overseers on this establishment, in point of emoluments, on a footing with persons of the same class in Bengal." With the expectation of this arrangement before them, the Board thought it proper to delay recommendations for promotion while the several ranks were indeterminate.

59. It was presumed that the previous approval by Government of Captain Best's minimum and maximum salaries being communicated to the Military Department, would be made known to the non-commissioned officers about to be posted to the department; but this would appear not to have been the case. The Board, however, communicated the order last quoted, to the Civil Engineers, who must have made the Overseers acquainted with its purport, and thereby supplied the motive to good behaviour, the absence of which is complained of by the officer commanding the Sappers and Miners.

60. The Government will be aware, from the foregoing statement, that the subordinate branch of the Department of Public Works is already partially organized, and is only awaiting the final orders of the Government of India for the completion of the arrangements.

61. One of the Surveyors now in the department was formerly a non-commissioned officer of Sappers, and the Board consider that similar situations are open to the present Overseers,

Overseers, (independently of their claim to promotion in their own line) if they are qualified according to the rules, and have acquired a colloquial knowledge of the native tongues.

62. The Overseers have certainly, for the most part, behaved extremely well, and their services in the conduct of important works have proved highly valuable; insomuch that it can scarcely be doubted that the whole amount of their pay has been saved to Government by their efficient superintendence. The instances of misconduct which have occurred, do not, in the opinion of the Board, militate against the general efficiency of the new system, imperfect as it still is. The three men that have been returned from this department were all addicted to intoxication, a vice which is too common among Europeans of that class to be attributed to characteristic circumstances in these instances.

63. The Board proceed to notice the subject of the reform of the Maistry Establishment, upon which they have nothing to add to their former remarks, but that their opinion is still the same as to the necessity of the proposed alterations and additions. 15 February 1847. Paras. 63 to 68.

64. With regard to the increase to the establishment of this office, the necessity for the measure is considerably greater than it was when the Board last addressed the Government on the subject.

65. The correspondence has necessarily much increased with the increase of officers and Overseers, as the following Table will show :—

	Letters received.	Letters sent.	Number of Sides of Collection.	Number of Sides of Current Business.
In 1846 - - -	3,016	1,672	6,537	10,246
In 1847 - - -	3,554	1,885	6,800	13,225
In 1848 - - -	3,961	1,883	7,850	16,195

66. It is consequently impossible to attend to any branch of the business so fully as is necessary for complete efficiency; and Government have remarked upon delays, which would not occur, were a more reasonable amount of work imposed upon the office servants.

67. The amount sanctioned by Government for copying the arrears of proceedings has been expended; but the work has exceeded the estimate in the sum of *Rs.* 350, besides *Rs.* 380 required for indexes to the years 1845–46. These amounts are consequently entered in the estimate for bringing up the arrears of 1847–48, which have accumulated as a matter of necessity, the Office Establishment being totally inadequate to carry on this part of the business.

68. The Board are obliged to solicit sanction for the amount of the said estimate, namely, *Rs.* 4,350, and at the same time to renew their recommendation that the increase to the Office Establishment and to the salaries of three of the present servants proposed in their last report may be granted.

69. They also consider it necessary again to lay before Government the proposition submitted 16 December 1844, for the appointment of an Assistant to their Secretary.

70. Government were pleased to observe, in negativing that proposition, that "it is not asserted that the Secretary's duties are more than he is able to perform;" but since that period the business has so largely increased as to be a serious burden upon the attention and labour of one officer. In 1844 the letters received amounted to 1,992, and those sent, to 1,241; in 1848 the former were 3,961, and the latter, 1,883. M. C. 31 March 1845.

71. The Board trust that it will be remembered that the office of Secretary, in this department, is not one of mere routine, but that many questions requiring patient consideration and the exercise of judgment, appertain to it at all times, besides the duty of attendance on committees and to other business not immediately connected with it, so that it seems of much importance that provision should be made for relieving the Secretary from some of the numerous details which distract his attention from more important matters, but which are of sufficient consequence to require the supervision of an officer.

72. Provision is therefore made in the estimate of Engineers required to give effect to the proposed new system, for a First Assistant Civil Engineer to be attached to this office; but the Board are desirous that the appointment, if approved, should be sanctioned at once, the necessity for it being undoubted, without reference to future arrangements.

73. The last proposition which the Board have to bring forward is, that permission may be granted for adding to the ordinary estimates a sufficient allowance for extra superintendence, whenever circumstances may require an increase.

74. There is at present no limit to the amount of superintendence that may be estimated for occasional works; but the rules, strictly understood, prohibit the extension of the principle to the ordinary works, however much their number and probable cost may exceed the average, or however plain may be the necessity of employing Superintendents to prevent unnecessary expenditure. This distinction between ordinary and occasional works is purely arbitrary, and in the opinion of the Board ought at once to be abolished; the amount of extra

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extra superintendence being left to be determined in all cases by the local officers, under the usual control of superior authority.

16 December 1844, No. 716. 15 Februar - 1847, No. 140.

75. The Board trust, that in forming a judgment upon their propositions, due consideration will be given to their former Reports, in which some of the subjects here briefly noticed are treated of in detail.

76. It will be seen that their opinions in substance remain unchanged, and that in the present letter they have principally endeavoured to define the arrangements contingent upon the increase of officers, which they have long felt to be urgently required, and which they are firmly persuaded would, if granted on a liberal scale, with a commensurate improvement in the Overseer and Maistry Establishments, abundantly repay the Government in the greater economy with which the works would be executed.

77. The propositions above referred to, are :—

Paras. 5 to 44. 1. An increase of officers sufficient to provide 20 permanent District Engineers, and an Assistant to the Secretary, besides the present Civil Engineers, with a reserve to fill vacancies, and to be employed on special works, or as Second Assistants; that is, an increase of from 25 to 37 officers to the Corps of Engineers.

Paras. 45 to 47. 2. A graduated scale of payment of the District or First Assistant Civil Engineers, as already recommended.

Paras. 53 and 54. 3. The addition of eight Draughtsmen to the establishment of the Civil Engineers.

Paras. 55 to 62. 4. The completion of the measure contemplated by the Government of India for placing the Overseer Establishment on the footing of that of Bengal.

Para. 63. 5. The reform of the Maistry Establishment, already recommended.

Paras. 64 to 67. 6. The increase of the Office Establishment, as already recommended.

Para. 68. 7. The sanction of an estimate of *Rs.* 4,350 for copying the present arrears of proceedings.

Paras. 69 to 72. 8. The appointment of a First Assistant Civil Engineer as Assistant to the Secretary.

Paras. 73 and 74. 9. That permission may be granted for adding extra superintendence, when required, to the ordinary estimates.

Paras. 28 to 31. 78. Of which nine propositions, Nos. 2, 3, 4, 7, 8 and 9 are recommended for "immediate adoption," and the Board would further solicit attention to these remarks on the necessity of providing Engineer Officers for the appointments in the other branches of public works.

(signed) *J. H. Bell.*

Appendix (I.)

Appendix (I.)

Letter from Major *H. C. Cotton*, Civil Engineer of the Fifth Division, to the Secretary to the Board of Revenue in the Public Works Department, on the subject of the Defective Qualifications of the Maistries, and the Measures necessary for Improving that Class, dated 26 February 1842.

Sir,

In consequence of a conversation I lately had with Colonel Sim on the subject of the Maistry Establishment of this department, I am encouraged to propose, for the Board's consideration, a plan for its improvement.

2. The Government has, on some late occasions, in the case of the failure of works, expressed, in the strongest terms, its determination to hold the Civil Engineer responsible for the security of all constructed within his range, directing that he shall not undertake works until he can obtain competent persons to superintend them. In my letter of 25th March 1841, on the subject of the Moothetamooty Vamy Bridge, in Tanjore, which failed three or four years ago, and on which I was ordered to report, I ventured, in some measure, to enter upon this subject, not so much to account for that particular failure, as to show the hazard every work is subject to from the incompetency of the Maistries; and the decision of Government was, as I have quoted, that the Civil Engineer should not undertake works without good superintendence. Were the Civil Engineer literally to fulfil the orders of Government, I am bold to say that scarcely a new work of importance, in any of the divisions, would ever be undertaken at all, unless the Civil Engineer confined himself to its superintendence, to the neglect of his other duties. No measures whatever are taken for the education of men for this very important and responsible line, and few indeed are found who have qualified themselves. The reason is palpable: the uncertainty of the service, and the want of prospects of advancement in it, prevent any respectable young man, who can get a sure livelihood in any other way, from entering it. The situations are usually filled by men of the lowest grade of mind, who perhaps can write, and, in an indifferent way, prepare the ordinary estimates, and perhaps draw the plans roughly of the common works of the country; but very few indeed can do more, and having grown up in the way of thinking themselves equal to their forefathers in the same line, are altogether incapable of improvement. These men, if put in charge of a work of any new description, or of any magnitude, have neither the

the mind to comprehend the plans, nor the judgment necessary to manage the details of the work. Without education, without natural talent (which would always find a better market in a thousand other trades or professions), without inducement to exert what talent or energy he may have, the Civil Engineer can never be justified, under the present orders of Government, in employing him to superintend a work of any magnitude.

3. The Civil Engineer's range is extensive, his works numerous, his time extremely limited: he can but expect to visit his greatest works two or three times during their construction; of many he cannot see the foundation even laid at their requisite depth; a vast deal must depend upon the Maistry. In the preparation and selection of materials, it is required that the Maistry should have judgment, experience and energy. In the arrangements for the conduct of the work, the proper division of labour, the judicious formation of embankments about the foundations, the baling apparatus, suitable to the depth, for raising the water. Whatever general instructions an Engineer may give, he requires not only a man who will thoroughly understand and endeavour to obey them, but one well qualified to do so, and who is capable of meeting unforeseen difficulties when left to himself. The generality of Maistries are, in a great measure, indifferent as to the permanent security of the works they are employed on, never, probably, for a moment looking so far forward, or being at all prepared to do more than follow the plan given him. Whatever varieties of soil he may meet with, the foundations would be laid the same depth. I have frequently found excavations going on in soil much more secure than any new brick masonry could be, and I have as frequently known foundations laid insecurely, through the sub-soil being of unequal firmness, and the plan adapted to a uniform soil being strictly followed; and not only the foundations, but every part of a work require tact and good judgment on the part of the Maistry. I need, therefore, only state that, generally, men so qualified are not to be met with. What the department requires is, that it should be permanent, respectable and well paid; and for the present, at least, measures should be taken to educate and bring up boys qualified for the service.

4. There is now no certainty in the service, men selected or taught by Civil Engineers themselves are, at a moment's notice, thrown out of employ, absolutely destitute, having given up, probably, good prospects in the revenue or other departments under Government, or private occupations, in which they might have gained a respectable subsistence. This was the case when Assistant Civil Engineers were called away for other service; and if the same principle continues, the whole establishment of the division will be thrown out of employ by the withdrawal of the Civil Engineer himself, when the corps is deficient in officers. This is the most decided bar to a hope of any improvement in the line. A man so cast out has no resources; it is not as in a country where private works open a great demand for professional men. In losing his situation he loses his bread; and as long as this is the case, we cannot expect to have anything but a most inferior class of men in the department.

5. The next requisite is that the line should be made respectable; what I have just mentioned prevents it entirely; but besides a permanent employ, a man who has been brought up for a particular profession reasonably expects to rise in it, according to his attainments; and as he would, in other professions, attain to distinction, he reasonably may expect to have some prospect of it in this.

6. The next consideration is, that the line should be better paid. A native is very willing to work on almost nominal pay, with an after prospect of providing, as he advances in life, for his family as well as himself, and as in all other departments of the service, regular grades of pay are urgently called for in this. There are, it is true, at present a few higher paid Maistries, and therefore there is less reform requisite in this particular than in any other, but system is wanting. There should be regular grades of advancement, and these made sure to those who most deserve it, merit and time of service combining to render each man eligible for promotion in rank and pay. A well-organized corps of Maistries would not be so expensive compared with its effects as the establishment under the present loose system.* There is, perhaps, no expenditure out of the public treasury so badly economized as in the Department of Public Works, owing to the total inefficiency of the Maistries. A cubic yard of earth deposited in a wrong place is often not only useless but injurious; not only is so much money wasted, but involves, perhaps, a far greater expenditure to remedy the mischief it has done; and this, as an example, is no untrue one of the waste of money on the one hand, or the want of systematic expenditure on the other, which is general throughout the department in this Presidency.

7. The last desideratum I have mentioned is the education of boys for the service, at least for the present, until the department is so occupied by qualified men, and established on so secure and respectable a footing, that it will invite into its body young men self-prepared

* I believe in some districts the pay of the Head Superintendent is given to a Gomastah, from that branch being deficient; and the man performing the duty of Head Superintendent drawing the pay of inferior Maistry. This, however, can scarcely be considered the intention of Government, and it is, I suppose, temporary. I merely mention it to show the necessity of the Maistries being regularly embodied in a corps. They should be all qualified men, recognized, selected and reported on, both as to qualification, and conduct, by the Civil Engineers as well as the Collectors; the latter chiefly because, while officers are so few in the department, the Civil Engineer cannot well ascertain the merits and faults of all.

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pared for its lower grades; but before I could recommend a single step in this matter, I consider that the faith of Government must be pledged to afford them all the advantages of a sure provision and advancement which are held out in other organized departments of the service. Without this it would either prove unsuccessful, and therefore a useless measure, or young men would be misled by false hopes into a line in which after all they may not find bread.

8. I will not attempt to propose in exact detail such a system as the exigencies of the service seem to require; but, as far as my experience leads me to judge of what is required, I would venture to propose, generally, the organization of a Maistry Corps on the following general principles. There should be one Maistry in every talook, with one Head and one Deputy Superintendent in each district; also, a Head and Assistant Maistry under the Civil Engineer, a First Class Maistry under every Assistant Civil Engineer, and a Second or Third Class Maistry under each Surveyor, with six boys or more to be placed by the Civil Engineer under the charge of himself, his Assistants or Surveyors, or the Maraumut Superintendents, as he may judge best for their education.

9. The Corps to be one, and every member eligible for advancement according to his proficiency; not merely in his particular district or division, but wherever he may be required; the Board of Revenue appointing them as vacancies occur, or giving especial employment to them according to their judgment, founded upon the reports and recommendations of the several Civil Engineers.

10. The Head Superintendent of each district should be on an equality with a Tahsildar, and the Deputy with the Deputy Tahsildar; I mean both to be paid as they are, and to be held in the same respect. They should not be advanced to the rank or pay for time of service only, but if duly recommended, after a fixed period of service, should be promoted as vacancies occur.

11. The Talook Maistries should be in three classes, according to their qualifications and time of service. The boys to be taken under instruction should be about 14 years of age, and able to read and write English, and understanding arithmetic, before they are received. The first two years to be employed in plan-drawing and estimate-making, in quarters and in the field; the third year they should be employed in actual work as a bricklayer. This I consider a most essential point in the training of a Maistry; and these three years should be considered probationary, no boys being placed on the list for regular promotion as Maistries, until in conduct and attainments they have qualified themselves fully to the satisfaction of the Civil Engineer.

12. The pay I would establish for each grade and class is as follows:—

Maraumut Superintendent of a District	100	rupees a month.
Deputy Superintendent of a District	60	ditto.
Civil Engineer's Head Maistry	70	ditto.
Civil Engineer's Assistant Maistry	40	ditto.
Talook Maistry, 1st class	35	ditto.
Ditto 2d class	22	ditto.
Ditto 3d class	14	ditto.
Boys under instruction, 1st and 2d year	5	ditto.
Ditto ditto 3d year, while at work as a bricklayer	7	ditto.

It is necessary to give somewhat higher pay to the Maistries employed under the Civil Engineers and Surveyors, on account of their being continually moving. In the above scale this has been considered.

13. In this proposal it will not, of course, be supposed that I would recommend the present Maistries to be embodied into an establishment of this kind. I believe that there are few who could be reasonably placed in a higher grade than the first class Talook Maistry, and not many fit to be employed at all.

There are, however, a few whom I happen to know fitted for the higher grades, and these I will mention:—

Ramasawmy Naick, at present Maraumut Superindendent in Tanjore.
Kistnasawmy Naick, at present Maraumut Superintendent in South Arcot.
Trimul Naick, Deputy Maraumut Superintendent in Tanjore.
Veerasawmy Moodelly, Deputy Maraumut Superintendent in Salem.

Being unacquainted with the other divisions, I can mention no more; but I have no doubt each officer could bring forward others.

These, with some selected from the talooks, and thoroughly examined and recommended by both the Collectors and the Civil Engineers, might at once be placed on the list, according to their qualifications, and the remainder filled up as qualified men are obtained.

14. In proposing an establishment of this kind, I cannot omit to notice that, in order to train and keep it up in order and efficiency, the attention of the Engineer Department is absolutely necessary: it could scarcely be expected to answer if, as at present, a whole division is left to one officer. I have made suggestions on several occasions respecting the number and description of Civil Engineers suitable to the present demands of the country, but this, of course, must depend on the principles to be pursued with respect to the general improvement of the country by public works. If it should be the intention of Government

to

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to follow a system of which occasional examples are displayed on a magnificent scale in Bengal, and, in one or two instances, in this Presidency: if it is confessed, as a principle, that improving the irrigation of the dry districts, arresting the volumes of water passing waste through the parched plains of the Carnatic, establishing navigable canals, roads and harbours; if it is admitted that such improvements are the positive right of a country which has so long been under British rule, and sent so much of its wealth to Great Britain; that such improvements would not only not * impoverish this country or its ruling Government, but work vast changes in the condition of the people, and as great in the declining revenues of the Government, then an efficient corps of European Civil Engineers, as a permanent arm of Government, should be established; † and the native portion, of which alone I intended to treat in this letter, would be formed into one of the most suitable and useful branches of the public service.

15. I must not omit to mention, however, the present class of Surveyors, a highly valuable and important establishment, when duly attended to by the officers; but there is no establishment in the world where order and efficiency can be kept up without directors; the want of officers in this department, and want of regular system throughout, has been the ruin of many an individual, and greatly crippled that portion of the department, while it has left the native portion in a degraded and extremely inefficient condition, for the most part little better than useless, and in truth an extravagant outlay of money, producing most disproportionate returns. If, in the common repairs of tanks and channels in earth-work, one-tenth could be saved by its being done with judgment, or one-tenth more effect produced from the same outlay, what means would not the Government have for the payment of a good establishment! My experience assures me, that considering the failure of embankments from bad construction, the loss of water and expense of construction, the mischief done by banks being made and channels opened where they ought not, and all the other consequences of the employment of men who have no judgment, and no inducement to exert what judgment they have, in works involving so great an expenditure as is exhibited in the ordinary estimates of the districts, there can be no question that a greatly improved establishment would be one of strict economy. I say one-tenth of the charge for earth-work throughout the Presidency with confidence that no less a sum would be saved if the work were properly done; and it probably would amount to much more.

16. The education of young boys, the better payment of the whole, putting the establishment on a footing of respectability, making it a permanent body and keeping up the establishment of the Civil Engineers and their Assistants, at least to their amount before the opening of the present wars, appear to me not only highly necessary but quite practicable, and in the strictest sense economical; independently of all advantages arising from its being then in the power of Government so to improve the face of the country as to bring out its own hidden resources, stimulate trade, and advance arts and manufactures, and in all other respects the prosperity as well as the political strength of the country.

I have, &c.
(signed) *H. C. Cotton*, Major,
Acting Civil Engineer, Fifth Division.

Manargoody Talook,
Needamungalum, 26 February 1842.

Appendix (J.)

Appendix (J.)

EXTRACT from a Letter from *F. N. Maltby*, Esq., Collector of Canara, to the Secretary to the Board of Revenue in the Public Works Department, being the Annual Report on the Roads of the District, dated 1 December 1850.

14. IT has been with much gratification that I have observed, during my present tour, how very much the advantages of these roads are now appreciated. Combined with the abolition of the transit duties, they appear to have given a marked stimulus to trade; and the increase in one principal article of a native's wants, as noted in the margin (which I can only attribute to the improved means of transport and the abolition of the land customs and those from port to port), will give the Board some idea of the increase to the people's comforts, which these communications have occasioned.

Cotton Piece Goods.	*Rs.*
1258 - -	1,83,500
1259 - -	2,15,900
Increase -	32,400

15. At

* A proof to this point is established far beyond question by the statement given in from the Fifth Division, showing a return of upwards of 300 per cent. per annum in revenue upon the outlay on many of the works of irrigation constructed in the last six or seven years.

† Not a corps whose services are dependent upon the external relations of the country, as those of a military corps must be, but one exclusively set apart for works of Civil Engineering; a corps of covenanted servants, educated, before leaving England, as Civil Engineers, and quite distinct from the military corps. This corps might be formed at first by volunteers from the Engineer Corps, and a few practical and experienced Civil Engineers from England. There could not be a better time than the present for drafting officers from the Engineer Corps for the purpose, because nearly all the First Lieutenants being Brevet Captains it is evident that the younger branches, who would be promoted to supply vacancies, are fully qualified for it by time of service and experience, and the Military Corps would rather be improved than injured by it. It would not be necessary to set aside the service of the Military Engineer Officers in the time of peace; employment would be found for them in the extended improvements for which peace would afford opportunity, and to which, during peace, the attention of Government would more especially be called.

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15. At Yellaneer, the people petitioned me to have the ghât of that name and that of Maula repaired, and the inhabitants of Mèl Bungady were equally anxious for the repair of the Kadidakul Ghât; and in the villages and towns below I see none of the anxiety which used to be shown to keep the roads at a distance from the villages.

16. I have dwelt at some length upon the subject of these cross roads, because an inspection of this portion of the country has satisfied me how much may be done by the outlay of small sums here and there. The villagers in many instances have shown a readiness to co-operate, and, were there a sum of money at command to be applied to improving the smaller roads of the district, I am satisfied that it would be in my power to secure results which it is almost impossible to do where every small item of expenditure must be previously sanctioned. There is no comparison between the alacrity with which works are carried on where a local fund enables the Collector to execute each portion at the most favourable moment, and the languor which results from the interval between the planning of some small improvement and its execution. I have seen this in the Salem district, where the bandy fund places a small annual sum at the Collector's disposal; and should the Ferry funds of this district be made available in the same manner, they would be applied to their most legitimate object, and secure very considerable results. I trust that it will be in my power to submit to the Board, in the present year, one or two works of this nature, which will not interfere with the execution of the larger works now in progress, and considerably extend their advantages.

17. At Bombay, the Ferry funds have now been applied to the improvement of the roads leading to them. In this district, the tax falls heavily on its commerce, and it has long been urged upon the Government that these imposts should only be considered as tolls applicable to the improvement of the roads; and I very urgently request the support of the Board of Revenue in soliciting from the Government that this means of local improvement may be placed within my control.

The Agoomby Ghât.

	Imports.	Exports.
	Rs.	*Rs.*
1258 -	3,50,292	48,943
1259 -	3,60,892	49,406
Increase -	10,600	463

18. The Agoomby Ghât is reported to me to be in excellent repair, and the increase in the trade is satisfactory, as far as it is indicated by our accounts. But a more satisfactory indication than these very incorrect returns would be the fact of wheeled-carriages being introduced into the district; but none are entered, and the Board will observe, that until the roads are opened to the coast full advantage cannot be derived from the money expended in constructing this ghât.

19. I am not fully aware from what causes it has arisen that, although 11 years have elapsed since the construction of the ghât, the plan remains incomplete, and the ghât stands isolated from the principal towns whose trade it was intended to assist. I believe it may in part be attributed to the imperative necessity of limiting even the most necessary outlay during the late war; but must also in part be due to the discussions which at first took place, whether Bramawar, Oodpy or Mangalore, were the best direction in which the road could be taken. The result is much to be regretted; for each of those roads was necessary to do justice to the plan of the Mysore Engineer, and to develope the resources of this district. I fully agree, however, with Mr. Blair, that the most important was that leading to the town of Oodpy and its seaport of Mulpy; from the large concourse of persons assembling every year at the Jatra, or religious fair held at that populous town, at which a very extensive trade, especially in cloths, takes place.

20. The road to Mangalore, I am happy to say, will be completed this year. The Oodpy road has been carried as far as Perdoor, and a branch road to Bramawar has been made practicable by the Ryots. The completion of the road from Perdoor to Oodpy and Mulpy is now the most important work remaining, and for this an estimate is before the Board.

21. I trust that an early sanction for this road will be granted by the Government. This alone remains to render the works complete. The sum required is but small, and of this the greater portion will answer a double purpose. The greater portion of the expenditure will be incurred in connecting Oodpy with the seaport of Mulpy, through a range of sandy paddy fields, of about three miles long. The port of Mulpy is one of our best protected harbours, lying behind the island of Deria Bahadur Ghur; but the only communication between this and the trading town of Oodpy is literally along the narrow divisions of the paddy fields, along which I could not even ride. Were it, therefore, only to connect the port with the town of Oodpy and the coast road, this expenditure would be necessary and advantageous, independently of its opening out the port to the trade of Mysore by the Agoomby Ghât. I therefore trust that the Government will enable me to carry out this work in the present year.

22. The work upon which Lieutenant Searle is now employed will very shortly be completed, and there will not be the least difficulty in superintending the outlay of this money.

23. In anticipation of the work commencing in the present season, I have ordered that the breadth of the road be marked off through the paddy fields, and that no second crops be planted; and even this will afford considerable assistance to the trade, by giving the merchants a broad straight road, instead of the present narrow and angular one.

24. I have heard with much satisfaction that there has been a meeting of some up-country merchants with some of those of Mangalore, to open a trade in cotton as soon as the Mangalore line is open for cart traffic. Should this result follow, the ghât will prove the direct means of extending the cultivation of the upper country.

25. The

25. The branch roads to the navigable rivers and salt cotays at Bajeh and Halandy continue fully to answer the intention of their construction, and to render the ghât and roads a source of increased revenue to Government. The following Table shows the value of salt sold :— Branch roads from Someshwur to Baj. and Hallady.

BAJEH.		HALANDY.	
	Rs.		*Rs.*
1256 - - -	12,966	1256 - - - -	27,519
1257 - - - -	22,703	1257 - - - -	21,668
1258 - - - -	23,011	1258 - - - -	29,811
1259 - - - -	24,339	1259 - - - -	29,379

26. This ghaut, and the road leading to it, are in excellent repair. I drove my carriage the whole way without any difficulty, excepting that arising from the unbridged nullahs and the narrowness of the passage round one of the rocks. It is an admirable work, and an increasing trade is the satisfactory result. The Coloor Ghaut and Road.

	IMPORT.		EXPORT.	
	1258.	1259.	1258.	1259.
	Rs.	*Rs.*	*Rs.*	*Rs.*
Rice and Paddy - - - -	1,00,974	1,90,946	—	—
Cotton Piece Goods - - -	2,14,000	2,30,800	—	—
Jaggery - - - - -	5,957	9,237	—	—
Grain - - - - -	4,365	15,523	—	—
Salt - - - - - -	- - -	- - -	7,353	9,685
Sundries - - - - -	91,227	12,968	13,750	9,025
TOTAL - - - *Rs.*	4,16,518	4,59,474	21,103	18,710

27. I am glad to find that Mr. Blane has advocated the adoption of timber road-ways, resting on stonemasonry, instead of arched bridges, for this ghaut. They are calculated to answer all the purposes required for many years, if they are overlaid with boards instead of fascines, to allow the drainage of the water instead of accumulating it. The temporary bridges have, however, been well repaired ; the sum sanctioned for annual repairs will suffice for the present season, and enable me to improve the approaches to the unbridged nullahs ; and since bandies are not likely to come into use until a carriage road is made in Mysore, I shall not have occasion to propose any outlay in the present year upon this line ; but I think that when other important works are completed, it is very desirable that these bridges should be built.

28. It is much to be regretted that any want of concert between the authorities of Mysore and of this country should render two of our best lines comparatively incomplete, that we should have left the Agoomby Ghaut without a road to the coast, and that they should leave the Coloor Ghaut without a road to the interior ; but I hope that both these defects will soon be remedied.

29. The sales of salt at Wundsay continue to reimburse to the Government the outlay upon this road :—

	Rs.
1256 - - - - - - - - -	8,852
1257 - - - - - - - - -	13,058
1258 - - - - - - - - -	12,512
1259 - - - - - - - - -	13,802

30. This important ghaut remains in its former state. I have, however, already addressed the Board of Revenue on the subject, under date 23d September last, requesting them to obtain sanction of Government for the sum necessary to enable Lieutenant Walker to make the trace of a new line. The trade of last season was very considerable, employing 1,00,501 bullocks, and 14,556 men.

The Guersippa or Hossulmakki Ghaut.

	Imports.	Exports.
	Rs.	*Rs.*
1258 -	1,36,732	52,234
1259 -	2,21,306	42,834
Increase -	84,574	9,400

31. The sales of salt at the Guersippa Cotays were as follows :—

	Rs.
1258 - - - - - - - - -	25,959
1259 - - - - - - - - -	26,761

Neelkoond Ghât.

	Imports.	Exports.
	Rs.	*Rs.*
1258 -	6,26,493	33,887
1259 -	7,20,760	28,219
Increase -	94,267	5,668

32. The trade by the Neelcoond Ghât exhibits a very great increase under the head of Imports, but a decrease under that of Exports. The increase has arisen from the brisk state of the cotton trade, and notwithstanding the advantages of the Devamunny Ghât, the old Neelcoond road will still continue to be used by many of the bullock drivers. The Devamunny line may be said to be fully occupied, and the dearness of the forage, and the impediment of the Deoga ferry, render the Neelcoond road still a valuable auxiliary to this extensive trade, especially for bullocks returning unladen.

The Devamunny Ghât and Hobly and Dharwar Roads.

33. I have never been more gratified in inspecting any public work than I have been by my late visit to this line. During the season upon which I am reporting, there was a great demand for Indian cotton, and the trade along the line was most brisk, carriage by carts being in a great degree substituted for that by bullocks. The following Table will show that almost every item of export and import by this route exhibits a satisfactory increase :—

	IMPORT.		EXPORT.	
	1258.	1259.	1258.	1259.
	Rs.	*Rs.*	*Rs.*	*Rs.*
Cotton - - - - -	40,095	9,73,050	—	—
Rice and Paddy - - - -	21,840	33,301	—	—
Grain - - - - -	21,637	9,311	—	—
Jaggery - - - - -	21,170	30,172	—	—
Cardamums - - - -	9,075	10,050	—	—
Pepper - - - - -	7,300	30,387	—	—
Turmeric - - - - -	22,032	39,780	—	—
Country Sugar - - - -	44,190	93,157	—	—
Cotton Piece Goods - - -	23,600	70,500	—	—
Copper - - - - -	- - -	- - -	3,660	11,490
Salt - - - - - -	- - -	- - -	68,346	76,425
Europe Cotton Piece Goods -	- - -	- - -	5,300	13,600
Sundries - - - - -	20,582	22,179	16,760	12,346
TOTAL - - - *Rs.*	2,31,521	13,11,887	94,066	1,13,861

But so much of the trade is carried on at night that these returns are very imperfect. The exports shown at Coompta Custom-house afford a better criterion, and from these it appears that the export of cotton was larger than has ever before been known :—

	Maunds.
1257 - - - - - - - - -	1,77,997
1258 - - - - - - - - -	72,642
1259 - - - - - - - - -	3,17,597

By a more accurate return of bandies kept in the Sonda Talook, it appears that more than 5,000 passed the ghât going and returning.

34. Such are the highly satisfactory results of this undertaking; I think we have now every reason to hope that, even in years of less demand, the cotton trade will be on a far more favourable footing than it has ever been before.

35. The road is now nearly complete, with the exception of three bridges, upon which Lieutenant Walker is at present engaged.

36. The trade in the present season has opened with increased vigour; while up to the 15th November 1849, 20,924 maunds had been exported; in the present season they amounted to 85,616. The road from Sirci has the appearance of the approach to some large fair, being crowded with cattle and lined with encamping grounds.

37. I have now to point out to the Board, that for such a traffic as this due preparation has not been made. The road and ghât have been made; they have most fully answered their object, but no adequate provision has been made for their preservation, and unless some measures are speedily taken, a vast outlay will be rendered necessary to repair the damage now going on.

38. Lieutenant Walker has described the state to which the ghât has been reduced by the wheels of the small Wudr bandies; and his description I can fully confirm, except that when I passed it, the mud had hardened into ridges. No public work could have been allowed to fall into such a state, were it not that the authority necessary to check it is so far removed from the scene. Bandiés, with wheels not two feet in diameter, piled with cotton and dragged by four bullocks, are allowed to increase by their action every little hole which a properly constructed wheel would tend to mend, and there is no fund available adequate to the constant repair required.

39. It

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39. It is only necessary for me to add, that one of the most emergent calls upon the Government is for a sanction adequate to keep this great line of traffic in a proper state of repair.

40. Connected with this line of road and its traffic, there is, the Board are aware, one difficulty still to be overcome. The Tuddery River, at the ferry of Deogah, is a very serious interruption to bandy traffic, so much so, that the bandies from the ghâts unload at the river, and the loads are ferried over and carried on hired bandies to Coompta. This is a very serious expense; the charge at the ferry is no less than 1½ anna per bandy load, and the hire to Coompta is at present 6 annas, making in all 7½ annas out of the hire from Hobly to Coompta, which is only *Rs.* 9 per bandy load. This is a heavy loss, and the delay is very serious, amounting to no less than three and five days.

41. To remedy this evil it appears to me, that a bridge of boats would answer, and that in the abundance of timber procurable down the river itself, the means of its cheap construction are at hand. Lieutenant Walker agrees with me that a river more thoroughly adapted to such a means of transport could hardly be found, and has promised to prepare an estimate of its cost. What proportion this would bear to the sum recoverable by a toll, I am desirous of ascertaining; should such a work be found practicable (and I have learnt that this has been found to be the case in Ceylon), the trade of this line will be relieved from one of its greatest difficulties.

42. The sales of salt at Oopinpattan, notwithstanding the extensive import from Goa, were as follows:—

	Rs.
1258	60,716
1259	72,430

43. Crossing over from Sirci to Yellapoor, I was enabled to descend the Arbyle Ghât, as well as to see the road constructed from Yellapoor to Moondagode last season, as well as that now under construction under Lieutenant Thornton of the Artillery, from Yellapoor to Hullial; while I was afterwards able to visit that in progress under Lieutenant Searle, to connect the ghât with Coompta, through Meerjan. The ghât is an admirable work and in excellent repair, and when the roads now in progress are completed, there can be no doubt of the trade being greatly extended. In fact, the trade has already more than doubled, having risen in value from *Rs.* 2,35,448 to *Rs.* 5,55,144. Already a considerable portion of the cotton trade is carried on by this ghât, the value having increased in the last year from *Rs.* 99,780 to *Rs.* 3,42,330, besides which a great number of bullocks which have descended by the Devamunny line return by this route in order to obtain cheaper fodder. Already bandy traffic has commenced, and it will soon be greatly extended. The work in progress under Lieutenant Searle will connect the line with the Salt Cotays of Nagurbyle, and unless the trade is superseded by the imports from Goa, must tell favourably on our sales.

The Arbyle Ghât.

	Imports.	Exports.
	Rs.	*Rs.*
1258 -	1,81,721	2,35,448
1259 -	4,77,976	5,55,144
Increase -	2,96,255	3,19,696

44. Two plans have been submitted to the Board for increasing the benefits of this work, and I trust they will receive early sanction. One is intended to connect the important town of Ankola with this line, the other unites this line with that of Devamunny, by a short road of about five miles. I have ridden along the trace of this line, and I consider it a most important improvement; as allowing the bandies which descend by Devamunny to return by Arbyle, and so relieving the line of greatest traffic where, as I have said before, the forage rises to an exorbitant price, viz., 8 annas a bundle. It completes the circuit of traffic, and renders Gokuru accessible to the numerous pilgrims who visit that spot during the great yearly festival.

45. Lieutenant Walker has stated that he is prepared to superintend this work at the same time that he is employed on the bridges on the Devamunny line. Lieutenant Searle's services will be available in the course of a few weeks, for employment, either on the Ankola or the Oodpy road, and the experience he has gained as well as his knowledge of the people around him, render it very desirable that his services should be continued. There will be no difficulty in carrying on these three roads during the present season, and each, though small in extent, is of great importance to the completion of the works with which they are connected.

46. I think the above report will prove to the Board, that if much has already been done, it has amply fulfilled the promises of improvement held out. I have had the gratification of seeing the most marked signs of prosperity evinced by thriving trade and extending cultivation. To extend the advantages already obtained by opening out smaller lines of communication is to ensure important results at a very trifling outlay. Since the abolition of the Customs it is less easy than it would otherwise have been to prove that Government has over and over again received an ample return for the outlay incurred, but I believe that in the article of salt alone, an ample profit has been received, while the sum paid by England to India for the cotton exported last year from Coompta may be estimated at *Rs.* 27,14,267.

Sales of Salt.

	Rs.
*1255 -	4,25,973
1256 -	4,39,203
1257 -	4,99,570
1258 -	4,45,503
1259 -	4,54,175
Goa imports to be added in 1259 -	17,831

47. I, therefore,

* Before the three cotays were established in connexion with the Agoomby and Coloor Ghâts.

Appendix (J.)

47. I, therefore, trust that the present season will not be lost for completing the Agoomby line to Oodpy, connecting the Arbyle line with Ankola, and forming the junction between the Arbyle and Devamunny lines.

48. When I joined the district of Canara in 1831, there was not a practicable line of road in the whole country, and wheeled carriages were unknown beyond the town of Mangalore. The change which I now observe is therefore peculiarly striking. Six excellent ghâts are now open and 508⅜ miles of good made road will be completed within the present season. They have, as always must be the case, proved the cause of increasing industry and extending cultivation. But it must be remembered, that they are still nearly the only existing roads in a province nearly as long as England, and having the area of Wales; and to use the words of Mr. Blair, in acknowledging the liberality of the Government towards the province in late years, it should also be remembered, that till of late years nothing had been done. The province calls for but trifling outlay in any other department of Public Works. There are no extensive tanks or channels to be maintained, but there are many fertile acres still capable of cultivation as soon as the natural difficulties of the country are overcome.

I have, &c.

(signed) *F. N. Maltby,* Collector.

Collector's Cutcherry, on Circuit Byndoo,
1 December 1850.

Appendix (K.)

Appendix (K.)

EXTRACT from a Letter from *F. N. Maltby,* Esq., Collector of Canara, to the Public Works Commissioners, respecting the wants of the Improvement of the Roads in his District, dated 5 June 1851.

5. I SHALL endeavour to show how far the statistics of the district, for the last few years, afford any indications of improvement in the comforts of the people and the revenues of Government, which is to be attributed to the works carried on at the public expense.

6. In some respects it may appear that the subject is an easy one. There was a period up to which it may be said, generally, that nothing was done to improve the district by a direct expenditure of the public money. The year 1836 may be fixed upon as the period at which the change took place; from that time, constant attention has been paid to the Maraumut Department, and several extensive lines of road have been opened out, successive sanctions have been granted, and about *Rs.* 5,25,000 have been expended. Concurrently with this expenditure, there has been a constant and steady advance in the improvement of the district; and, in returning to it after an absence of some years, I can see the most striking signs of improvement, and these appearances are borne out by the public records.

7. But it would be a great mistake to attribute all this result to the one cause I am alluding to; many concurrent causes have been in operation. A revision of the assessment, which has had the result of relieving a great portion of the land from the demand suspended over it, and has thus left improvements unchecked: the abolition of the transit duties, and the Hawlut Duty on the supary, pepper, and cardamums; the reform of the Tariff, and abolition of duties from port to port; the abolition of the coffee monopoly in Mysore; are all important changes which have been in operation during this period, and have each told upon the trade of Canara. In a general view of the progress of the district, the improvement in the means of communication can therefore only be considered as one out of many favourable causes; but with this qualification, a comparison of the accounts furnished to Mr. Cotton's commission in 1838 and 1839, with those of subsequent years, will afford a very fair view of the progress of the district under a system of improvement in which the construction of roads holds an important place. After giving some instances of the general advance of the district, I shall allude to some which may be immediately attributed to this cause.

8. To endeavour to prove the fact that the construction of roads has advanced the interests of the district, may appear superfluous; but my object is rather to prove that in this district they may be said to have paid for their own construction.

9. The principal heads under which a view of the progress of the district may be best arranged, appear to me to be, the state of the population; the state of the land revenue; a comparison of the export of the principal articles of production and trade with the interior; a comparison of the import of the principal articles of consumption; and the progress of the Salt Trade, both of home consumption and inland trade. I shall give some facts connected with each of these, as briefly as I can.

Population.

10. For many years past, the returns have been made with great care, and may, I think, be considered as faithful. The following shows the rate of increase since the year 1835, being

being the first year which comprehended the territory annexed from the kingdom of Coorg :—

	Rs.
Fusly 1245	7,68,123
„ 1248	8,34,874
„ 1251	8,77,061
„ 1254	9,20,591
„ 1257	9,94,656
„ 1260	10,56,333
Increase in 15 years	2,88,210 or 37 4/7 per cent.*

Land Revenue.

11. In the answers transmitted in 1839 to Mr. Cotton's Commission, the average revenue of the first five years of the Company's Government is compared with the five years from 1243 to 1247, as follows :—

	Rs.	a.	p.
Average 1209 to 1213	16,90,704	11	11
„ 1243 to 1247	17,10,621	6	7

From that period the revenue has continued steadily to increase from year to year, without the exception of a single year, and now amounts to *Rs.* 18,14,677. 9. 3, exclusive of the Coorg moganies.

12. In 1839, Mr. Blair made the following estimate of the future land revenue of the district, including the Coorg moganies :—

	Rs.
The Settlement at that time	18,10,000
Instalments to be realized	38,000
Future additions from waste	17,000
	Rs. 18,65,000

The present revenue, amounting to *Rs.* 18,97,376. 12. 9, proves how steadily the instalments have been realized, and what a very satisfactory advance the agriculture of the country has made.

Export Trade.

13. The principal export trade of Canara is rice, of home production, and imported from Mysore. As bearing upon the improvement in our roads there is no occasion to distinguish these.

Rice.

The rice trade is affected by such a vast variety of circumstances, that it is sufficient for me to observe that, notwithstanding the great increase in population, and improvement in the comfort of the people, the district can still export more largely than when the population was 2,80,000 less than at present.

	Mooras.
Average Exports, 1812 to 1816	10,54,048½
„ 1833 to 1837	10,73,469¼
„ 1845 to 1849	13,11,425
Highest Export, up to 1837	11,04,957
Highest known Export, 1845	14,66,391

Cotton.

14. The Export of cotton has been more affected by the improvements in our public works than any other branch of our trade. In 1836, the first improvements were made in the Neelcoond Road. In 1848, the Davamunny Ghaut was opened; and, in 1850, the Arbyle line was opened, though not completed. The results are these :—

	Candies.
Average Export of Cotton, 1812 to 1816	1,630
Ditto 1833 to 1837	9,721
Export of 1839-40	9,082
„ 1840-41	24,732
„ 1841-42	30,891
„ 1842-43	33,762
„ 1843-44	38,368
„ 1844-45	24,239
„ 1845-46	22,662
„ 1846-47	25,515
„ 1847-48	25,885
„ 1848-49	9,413
„ 1849-50	39,032
„ 1850-51	42,735
Average of last 5 years	28,516

	Candies.	Value Rs.
Largest Export up to 1238	17,237	15,44,554
Largest subsequent Export	42,735	31,46,454

A very

* *Note by the Public Works Commissioners.*—But there is no doubt that the returns of the later years, and particularly of the last of all, have been much more accurate than those of the earlier years.

Appendix (K.)

A very large proportion of the cotton is now brought down upon carts, and it is brought into the market to meet a sudden demand, in a manner which was before impracticable.

Coffee.

15. The Coffee trade of Mysore has received a stimulus, both by the abolition of the monopoly in that country and the opening of our roads:—

	Candies.	*Value Rs.*
Average Export 1812–13 to 1816–17	30	
„ 1833–34 to 1837–38	474	
Export of 1849–50	4,077	3,24,088

16. Generally, I may state that I do not find a single important article of our trade in a declining state, while most evince a very marked improvement, of which the following are some examples:—

	Jaggery.	Sugar.	Turmeric.
	Cs.	*Cs.*	*Cs.*
Average 1812–13 to 1816–17	779	369	498
„ 1833–34 to 1837–38	702	747	1,373
Highest Export till 1838	1,805	2,386	1,714
Export of 1849–50	6,158	4,044	3,941

17. Our imports by sea are but trifling, as most of the articles required by the people are brought from the interior. Among those which our accounts exhibit, cocoa nuts and piece goods are fair representatives of the advance of our inland trade:—

	Cocoa Nuts.	Piece Goods.	Copper.
	No.	*Value.*	*Candies.*
Average, 1814–15 to 1818–19	4,32,540	—	—
Average, 1818–19 to 1822–23		85,184	140
Average, 1833–34 to 1837–38	4,17,512	78,920	180
Average of last five Years	15,68,407	1,38,858	283
Highest Import to 1837–38	9,96,600	1,21,864	249
Highest recent Import	19,86,175	1,76,528	356

The importation of gunny bags is a strong indication of active trade. It rose from (value in rupees) 9,480 in 1848 to 98,134 in 1849. Even if it should appear that this has been accompanied by a decrease elsewhere (of which I am not aware) and that it is only a change in the line of trade, this change must indicate a remarkable advantage conferred upon trade by an improved line of commerce.

Salt Revenue.

18. There is perhaps no branch of our statistics which indicates more clearly the advantages derived from the construction of our roads than the Tables of the Salt Revenue.

I find that in Fusly 1248 (1838–39) the salt sold by Government and imported from Goa amounted to Madras garce 3,082. It has since risen to Fusly 1259 (1849–50) M. G. 3,988, and in the present year will be still higher; and this, notwithstanding an increase in the selling price from *Rs.* 105 to *Rs.* 120 per garce.

The net Government revenue of the two years may be calculated as follows:—

	Rs.	*a.*	*p.*
1248 (1838–39)	2,48,346	11	6
1259 (1849–50)	3,68,478	14	11
Increase	1,20,132	3	5

To endeavour to prove how far these indications of prosperity may be attributed more immediately to the improvements in our roads the salt accounts are the most useful.

The Sumpajee and the Munjarabad Ghauts lead to the Cotay at Buntwal. In Fusly 1247 (1837–38) the collections were *Rs.* 63,753. They have since been as high as 1,44,434; viz., in Fusly 1257 (1847–48).

The

The improvements in the north of the district affect principally the sales in the Ankola and Honore Talooks. Appendix(K.)

	Rs.
In Ankola the collections of 1247, were - - - - - -	17,989
They have been as high as (1257) - - - - - -	1,01,517
In Honore the collections were in 1247 - - - - - -	51,548
They have risen as high as (1257) - - - - - -	76,449

and this, notwithstanding that the superior road of Davamunny in Ankola, diverted so much of the trade from the partially improved line of Neelcoond.

19. The Buntwall, Soopah, and Sondah Talooks are the only portion of the district * capable of showing that expansion of cultivation which the Commissioners seem to think likely to attend an outlay of public money; and it happens that in those talooks, or near to them, the greatest outlay has been made. The result is as follows :— Extension of cultivation.

LAND REVENUE.	Buntwal.	Soopah.	Sondah.
	Rs.	*Rs.*	*Rs.*
1247, or 1837-38 - - - - -	2,33,365	77,318	1,22,373
1259, or 1849-50 - - - - -	2,72,435	94,813	1,37,169
Increase - - -	39,070	17,495	14,769

This should not be viewed as the mere result of favourable seasons, and as likely to fluctuate with them. It is the steady advance of cultivation upon the jungle, and the revenue added may be viewed as a permanent annual addition to the revenue of the state.

20. The ferry farms afford a very correct indication of the extension of our trade. They have risen from *Rs.* 4,964, the highest collection up to 1838, to 7,868, the revenue of the present year. Ferry Farms.

And here again, tracing this more directly to the effect of work in the Buntwall Talook (affected by the Sumpajee Ghaut) they have risen from *Rs.* 357 to 939. In Ankola (affected by the Arbyle Ghaut) from 483 to 1,136. In Honore (affected by the Devamunny) from *Rs.* 458 to 1,840.

21. Placing all these facts together, I believe I may say, that it clearly appears that even with respect to this district alone, the outlay incurred by the Government on works of improvement has been amply reimbursed; and when to this is added the advantage derived from extended cultivation and improved resources in the interior, including Mysore, Bellary, and Dharwar, I think it will clearly appear that to open out fresh lines of communication to the interior, and to improve our district roads, will be a source of actual revenue to the Government, as certainly as it will be a blessing to the people.

22. Experience and careful supervision now enable us to carry roads through the ghauts at a very moderate expenditure; and if it should fall within the office of the Commissioners to trace out any system of public improvement, I feel confident that they will consider that the roads of this district may be classed as among the most remunerative works which can be undertaken at the public expense.

Appendix (L.)

MINUTE recorded by the Honourable *John Sullivan*, Esq., Member of the Council of Madras, on the importance of improving Irrigation, dated 5 September 1840. Appendix (L.)

IN his report upon the causes of the decline in the land revenue, Mr. Cotton has observed, that "there is no country in the world where the items constituting an unfavourable season are so few, and where the means of obviating them are so extensively within the power of Government, as in the Madras territories; there is no part of any one district which cannot with the greatest facility be brought under the influence of a river; so long, therefore, as one drop of water is allowed to run waste into the sea we must take blame to ourselves for not exerting our best efforts to obviate the evils of scarcity or the dreadful effects of famine." Report, 20 February 1840, para. 61.

2. In

* That is, the only part of the district where it is exhibited in the official accounts; because in the rest of the district the revenue is assessed on whole estates, and does not vary with the extent of actual cultivation.—*P. W. Commissioners.*

Years.	*Rs.*
1247 -	324,47,821
1248 -	314,34,888

2. In the last revenue year 1248, there was a falling off in the collections from the land of upwards of 10 lacs in comparison with the collections of the preceding year. Famine was felt partially in the districts of Ganjam, Vizagapatam, and Rajahmundry; and in almost every district the crops were injured materially from drought.

3. That these evils might, to a very great degree, be obviated if we took proper advantage of the means which Providence has put within our reach, is plain from the state of those districts which are to a certain extent watered from the rains of the S. W. monsoon.

4. Although the crops in Tanjore are frequently prevented from coming to perfection by the failure of the periodical rains, and are occasionally injured by an excess of rain, that district serves as a granary for the South of India in the worst of seasons. It owes this advantage entirely to its works of irrigation, the soil of the province being by no means naturally fertile.

5. It will be seen by reference to the accounts appended to this Minute, that there is the same steadiness of produce in all those parts of the districts of the Southern Division which are irrigated from the same source; that when, from a failure in the periodical rains, there is a great deficiency in the revenue from dry lands, and from land under reservoirs which depend for their supplies of water entirely on the local rains, there is little or no defalcation from the lands which are watered from the rains of the S. W. monsoon. They are always a saleable and transferable property, and yield every variety of produce.

6. Much has been done to improve the irrigation of these districts of late years, particularly of Tanjore, Trichinopoly and South Arcot; and works are now in progress, which, by turning the waters of the Rivers Kistnah and Godavery to the purposes of irrigation, will give the Northern Districts the same advantages in this respect as are possessed by the Southern. But as the advantages which would be derived from an increased and systematic expenditure in this department do not appear to be generally understood, I shall venture a few remarks upon the subject, taking as my guide a report made by Captain Arthur Cotton * to the Board of Works, a copy of which I append to this Minute.

Districts.	Rupees.
Nellore - -	7,26,301
Bellary - -	11,15,888
Cuddapah - -	9,93,679
Chingleput -	3,04,752
North Arcot -	12,09,086
South Arcot -	9,77,946
Salem - -	3,41,504
Tanjore - -	35,28,761
Trichinopoly -	7,52,030
Tinnevelly -	12,13,409
Madura - -	4,27,669
Coimbatore -	4,15,663
TOTAL - -	12,006,688

7. That officer estimates the annual value of the crop, which depends upon works of irrigation under the charge of Government, at 320 lacs of rupees, and the annual revenue derived from nunjah or rice lands at 118 lacs, or about one-half of the whole land revenue; and he calculates from the increase which has accrued to the revenue of Tanjore, Trichinopoly and parts of South Arcot, from improvements in the sources of irrigation, that if equal attention was given to the works in other districts, there would be an increase in the gross produce of 93 and in the revenue of 35 lacs.

8. He comes to this conclusion from facts which have come under his own observation; viz., that all the tanks in the country, and all the channels, excepting those of Tanjore, and the very large ones of other districts, water "less land than they once did, many only a quarter, and great numbers from one-half to three-fourths; that the Nunja revenue in North Arcot is three lacs below what it was 10 years ago, two lacs less in South Arcot, and in Tinnevelly three quarters of a lac."

Paras. 10 and 11.

9. In Tanjore, where particular and systematic attention has been given to the works for many years, there has been no less an increase than nearly 40 per cent. in the gross produce; the variations in the amount of the produce in the first five of the last 30 years, were from 100 to 57; in the last five of the same series they were only 100 to 95¼.

10. This steadiness of produce Captain Cotton considers to be the best test of the "state and effect of the irrigation works, both because the very object of them is to obviate the effects of the irregularity of the seasons, so that the crops may not be drowned in very wet ones or burnt in very dry ones, and also because it is an effect which is most clearly to be attributed to that cause."

Para. 13.

11. He estimates the original cost of all the works of irrigation at 825 lacs of rupees, and the annual expenditure upon them at *Rs.* 6,30,000, or two-thirds per cent.; 5 per cent. upon the actual revenue, viz. 118 lacs; and 2 per cent. upon the total annual produce which is dependent upon them. In England the annual outlay upon works in which water is retained is from 3 to 4 per cent. on the original cost, or from four to six times as much as is allowed in this country; this difference, he thinks, affords *primâ facie* evidence that the expenditure in this country is inadequate. He shows that a tract of land in Tanjore, which yielded a revenue of *Rs.* 26,000, and a property of *Rs.* 60,000 a year, was rendered unproductive for six years, in consequence of the limited establishment of the Repair Department, which would not admit of the necessary repairs being made when they were required. They were ultimately done at an expense of *Rs.* 23,000, but not until "an annual loss of property nearly three times as great as the sum required to restore the works; and in six years property to the amount of 3½ lacs of rupees had been lost, for want of an expenditure of *Rs.* 23,000 and an officer to plan and conduct the work."

Para. 14.

12. He

* For that report, *see* Appendix (B.), above.

12. He gives another instance of the ruin brought upon property, and damage done to the revenue, in the district of South Arcot, from a delay of eight years in excavating a channel of importance, which from neglect had been allowed to fill up to a depth of about two yards. The revenue, which under the Nabob had been five or six lacs, and under the earlier periods of the Company's Government, *Rs.* 2,20,000, had gradually fallen to *Rs.* 1,18,000. The talooks were almost ruined, and many of the people had emigrated. In the course of six years from 1831, by an expenditure of about a lac and a half of rupees, the revenue had increased to *Rs.* 2,58,000, and has gone on increasing ever since. This delay, so costly to the Government and the people, was occasioned entirely by a want of hands in the department.

Fusly Years.	Rupees.
1244 - -	1,81,180
1245 - -	2,42,879
1246 - -	2,37,171
1247 - -	2,72,727
1248 - -	2,82,305
1249 - -	2,90,605

13. Captain Cotton observes, that as lands watered from Government works are bought and sold in dependence upon the faith of Government, that the works will be kept in good order, justice, no less than policy requires, that this obligation should be faithfully discharged; "None," he says, "but those who have been in actual contact with the people, can believe the extent of loss to which landowners have quietly submitted from a failure in the irrigation works." "There are at this moment multitudes of estates, that are of one-fourth and one-half the value that they once were, owing to the decayed state of the irrigation works."

14. Omitting Tanjore, where the revenue, from the unremitted attention which has been paid to the works has steadily increased, the land revenue of the watered districts was on an average of five years, terminating with Fusly 1214 - - 214 lacs.
1219 - - 216 „
1224 - - 203 „
1229 - - 215 „

Since which it has regularly declined in 15 years to 189½* lacs, being a falling off in that period of 26½ lacs per annum (more than four times the whole cost of the Repair Department) in a period of profound peace, and "under a strong, orderly and upright Government."

15. Taking Tanjore as an example, it seems highly probable that if the works could have been maintained in the same state of efficiency in other districts, the revenue would at all events have been maintained at its former standard, instead of having declined during the last 15 years to the extent of more than a crore of rupees. Para. 24.

16. In Coimbatore, where "the works consist chiefly of noble channels of from 30 to 50 miles long, supplied by very solid annicuts across rivers filled by the south-west monsoon, while the rest of the revenue, from want of rain and other causes, has miserably declined, the nunjah revenue (under these channels) has not in the least diminished, the expense of keeping these works in repair being very insignificant."

17. If all the water which now runs waste down these rivers in favourable years was stored up and turned upon the land, there would be a sufficiency in moderate seasons (Captain Cotton estimates) to water at least a million cawnies, or a tract double the extent of Tanjore, which would provide grain for about two and a half millions of people.

18. The positive importance to the cultivation of all the rivers which are fed by the south-west monsoon in the southern districts, and their relative importance, are clearly shown in the Report of the Collector of Coimbatore for Fusly 1248: "With respect to the wet cultivation" (he says) "the south-west monsoon afforded a very deficient supply to the tanks, and as the wet lands in the district cannot be cultivated to any extent unless a full supply is received in both monsoons, they were, therefore, left waste to a considerable extent. The freshes in the Noyel were unusually low; hence the greater part of the wet land dependent upon this river was left waste. In the Cauvery there was an average supply of water, and nearly so in the Bowany and Umbravutty. The wet cultivation of several villages dependent upon the latter river suffered from the lowness of the freshes; but with this exception, the wet lands irrigated by the channels were cultivated to the usual extent."

19. The tanks depend for their supply upon the local rains, it is therefore precarious; the rivers are filled from the rains which fall on the hills, and their relative supply depends upon the geographical position of these hills. The Cauvery has its source in Coorg, which is further west than the Neilgherry range in which the Bowany originates; this range again is nearer the western coast than the Delhi range in which the Umbravutty rises; and that range is further west than the range in which the Noyel has its source.

20. The same results as occurred in Coimbatore in 1248 will be found in every district. The nunjee revenue which depends upon tanks, fails with the poonjee in a bad season, because they depend for their supply upon the local rains; but the cultivation under the river channels is not affected, or only partially affected, when the local rains fail. Hence the pressing necessity of extending the reservoirs and cultivation from those sources.

21. The

* The average yearly revenue in the three periods was as follows:

	Rs.
In the five years terminating with Fusly 1234 - -	202,60,000
Ditto - ditto - - 1239 - -	198,30,000
Ditto - - ditto - - 1244 - -	189,50,000

Para. 30

21. The increase of revenue from such works Captain Cotton calculates would be, one rupee per annum for four rupees of outlay, or 25 per cent.; and judging from actual results, this estimate appears to be quite on the safe side, that is to say, for works which are to be supplied from rivers fed by the S. W. monsoon. In general the produce of wet is to that of dry land, as five to one at least, so that the increase of revenue from dry converted into wet, is from 1,000 to 5,000. If this conversion is effected merely by the extension of existing works, the outlay is trifling and the gain immense; the following is an example: In 1806 dry lands, which yielded an annual revenue of *Rs.* 9,641. 14. 5., were converted into wet, by the prolongation of the Calingaroyer Channel of the Bhovany River in Coimbatore, and the revenue increased to *Rs.* 51,169.

Difference - - 41,527

which it has yielded ever since. The estimate for a further continuation of the channel is *Rs.* 41,000, and of increased revenue *Rs.* 21,000.

22. But if new works are to be constructed, annicuts for instance, for appropriating the rains of the N. E. monsoon, which are comparatively scanty and precarious, the outlay will be heavy and the profits proportionately reduced; it may be safe, therefore, to take 25 per cent. as the average return.

23. This increase, however, is but one item of the advantage of converting dry into wet land. It is the certainty of the revenue, where a perennial stream is carried over the land, that gives a peculiar value to such a change. It is not only the great increase that has taken place in Tanjore, and in parts of other districts which enjoy the benefits of river irrigation, but the steadiness of the revenue. While very large remissions of revenue, and dreadful losses to the people, have occurred upon the lands which depend for their produce upon the periodical rains, the wet lands of these districts have continued to yield their harvests, and have been the means of keeping the people alive.

24. It is remarkable, with the melancholy evidence which each year brings with it, more or less, that water, and water alone, is wanting to prevent those dreadful famines which periodically afflict us, that "attempts should have been made to throw a doubt on the policy of extending works of irrigation." It is the failure of the periodical rains that brings with it famine and pestilence; it is from that cause alone, and not from over-assessment, that the prosperity of the Madras Provinces is retarded. There is but one remedy, and that is, to store up the waters that are now permitted to run waste into the sea, and turn them upon the land.

25. For doing this we possess an advantage that has never belonged to any other Government. We have the command of the whole course of the rivers which intersect our Southern and Centre Provinces, and such a command of those that run through the Northern Districts as will enable us to turn them to the best account.

Para. 52.

26. Captain Cotton proposes to begin by constructing large reservoirs in the hills in which the Southern rivers have their rise; "the fine basins, with narrow outlets, that are found on the hills, the certainty of the supply of water, and the extent of the cultivation in the low country, subject to occasional deficiency of water, offer peculiar advantages which might easily be secured; a great part of the crops are frequently in danger, from the supply of water being inadequate towards the time of the crops ripening on the land at present watered. This danger might be obviated if the surplus water which the S. W. monsoon affords could be stored on the hills for use in the dry season;"* new channels, or the lengthening of the old ones, might be executed with advantage, but without any new works below; an additional supply of water would increase the revenue, by enabling the Ryots to cultivate two crops where at present they only give one.

Para. 33.

27. It would also enable the Government to restore ancient reservoirs in the low country, which have been suffered to go to decay; amongst others the "Ponairy in Trichinopoly, a reservoir 30 miles in length, with a river channel 50 miles long, which filled, besides the Ponairy, many smaller tanks. The advantages of this undertaking would be—

"1st. In the high freshes of the Cauvery, a large body of water, which at present runs to the sea, would be stored up in the Ponairy and other tanks, against the time of the low freshes.

"2d. During the moderate freshes, when there is much more water than we can use for the present cultivation, a portion of it would be conveyed to a vast extent of lands, watered immediately from the channel, as well as those under the tanks for immediate use.

"3d. There would be a most complete water communication from the upper part of the Cauvery to Porto Novo, which would be navigable for about seven months in the year, and for boats drawing not more than one foot, for perhaps nine months.

"4th. A portion of water during the dangerous freshes would be led off from the river, and then what at present is worse than useless would become very valuable. Every tank that is constructed to be filled during the high freshes is a step towards relieving the country from damage by floods. The main branch of this channel might also be carried across the 'Vellaur' into South Arcot, conveying the water of the high freshes

* Report from Captain A. Cotton, dated 4 December 1828.

freshes of July and August into innumerable tanks at present dependent upon the rains of the N. E. monsoon; nor is there any reason whatever why it should not terminate in the Cooum at Madras, for it would have a fall of three quarters of a foot per mile, and there is no serious obstacle to the cutting a channel all along that line. The waters of the S. W. monsoon would thus be conveyed through the very heart of the Carnatic, and incalculable advantages derived from them."

28. Captain Cotton proposes to accomplish this great work by leading off a large channel from the upper annicut, carrying it on as high a level as possible, so as to take it through the middle of the Arialoor and the Woodiarpolliam Talooks in Trichinopoly, cultivating much land immediately from the channel, filling almost every tank in those Talooks, which are now dependent upon the local rains, securing a great portion of the water of the various jungle streams crossed by it, and discharging itself into the Ponairy.

29. Such a channel would command the whole of the lands through which it ran, and render the two Talooks "almost as productive in proportion to their extent as Tanjore;" they contain, it is said, a great extent of excellent land for irrigation, population is pressing hard upon the present cultivation, and the people are represented as so anxious for the works, that the value of the land has already much increased in the prospect of their being executed.

30. The third great work which Captain Cotton points out as feasible is to convey water from the Colleroon across the River Vellaur, at the north end of the Veraunum Tank, into the Bowanagherry Talook, in South Arcot, filling the great tanks called Wallajah and Peroomalairy (which if filled would yield a revenue of *Rs.* 50,000 a year) and others, and terminating at Cuddalore.

31. The fourth is the reconstruction of an unfinished or damaged annicut which crosses the River Cauvery at Nerinjapet in the Coimbatore District, and the excavation of a canal upon such a level as would admit of its waters being carried into the very heart of the Carnatic.

32. The fifth is the construction of an annicut across the Palaar, for turning its waters, which now run waste into the sea at the rate, it is supposed, of 200 million cubic yards a day, over the whole country between the mouth of the Amboor Valley to the coast, "filling the innumerable tanks which would lie in its course, and incalculably improving the whole country between the Ghauts and Madras."

33. It is estimated that the population of the 12 districts which form the Southern and Centre Divisions (Nellore included) is increasing at the rate of 1 per cent. per annum, so that at the end of 11 years there will be 1,000,000 additional mouths to be provided for.

34. To supply this number with food, 1,25,000 caunies of nunjee land would be required to be brought into cultivation, it appears that the cultivation of nunjee during that period has greatly declined in some districts, and has been nearly stationary in others. Every step that is taken to convert dry land into wet, "diminishes the danger of scarcities, and greatly increases the comforts of the people; for perhaps one-half the number of persons are required to raise a certain quantity of food in wet land, as required on dry, and the remainder will of necessity be employed in manufactures."

"By irrigation every species of produce is improved, and the labour of tillage reduced, while the amount of produce is increased on any given space, and if the extent of population does not keep pace with that increase, or new varieties of crop do not prevent a superabundance of the grains now commonly cultivated, the decrease of price must be followed by a corresponding decrease in the commutation at which the assessment is made, whereby both grower and consumer will be directly benefited, and the Government repaid by the extension of cultivation, and the improved means of the people." Mr. C. Cotton's Report, para. 63.

35. No stronger proof can be given of the importance of this subject, or of the necessity for a vigorous effort to put the revenue from the land upon a permanent footing, than the fact that the demand against the five districts which compose the Northern Circars, during the last four years, was 2,50,02,390, and the collections only 1,76,95,763; difference, 73,17,627. This large defalcation arose in districts in which Government made great sacrifices when they formed the Zemindary settlement, in order to secure a steady revenue. The bad management of the Zemindars may have contributed to this result, but the main cause was undoubtedly failure in the periodical rains. This failure did not materially affect the large rivers which run through them, the "Kistnah" through Guntoor and Masulipatam, the "Godavery" through Rajahmundry, and within the reach of Vizagapatam, as branches of the "Mahanuddee" probably are of Ganjam.

36. It is no longer a speculation, the fact has been put beyond doubt by actual survey, that Masulipatam may be made more fertile than Tanjore, and the cultivation of large tracts in Guntoor put beyond the hazard of failure, by applying the waters of the Kistnah to purposes of irrigation; and there is every reason to believe that the same advantages might be obtained for the other districts, by making the same use of the rivers which either intersect them, or which might be turned into them.

"Though the country" (observes Captain Cotton) "cannot advance without good Judicial and Revenue management, yet it is indisputably certain that nothing can avail, unless the irrigation Para. 55.

Appendix (L.)

irrigation and communications are attended to. While the population is mainly dependent upon the local rains of so precarious a climate for their cultivation, four-fifths of the population must be employed in merely raising food, and every five or six years we must witness the deaths of tens of thousands by famine, and the great body of the people must be without clothing, or anything but a bare subsistence even in fruitful seasons." If we want to promote the general health and comfort of the community, we must be sure to lay a good foundation by supplying them with plenty of food. The price of exportable produce of course depends entirely upon the facility with which food is raised, and upon the price of produce entirely depends its capability of competing in foreign markets. Thus, if food could be raised in this country with one-half of the labour that it has hitherto required, cotton, iron, &c., could be produced at greatly diminished prices, and the profits upon them in foreign markets proportionally increase.

"It is often remarked that there are so few manufactures in the country; how can it be otherwise, when almost all are required to raise food, and of the remainder such a number to carry it about; and when everything must be brought to where it is required at such an enormous price; a price which, if it existed in the same proportion in England, would at once destroy nine-tenths of the traffic of the country." With a healthy climate, abundance of fertile soil, unlimited mineral treasures (the first iron perhaps in the world), ample supplies of water if taken care of, an increasing population, a surface extraordinarily favourable for communications, internal and external peace, and almost any amount of capital at the disposal of Government, there can be no difficulty in raising abundance of food, and of raising it with more economy than in any other country in the world, there is really nothing wanting but action to produce such a change as cannot now be conceived.

38. We have seen that the average collections from the land* for the first five years of the present century, viz., from Fusly 1210 to 1214, amounted to *Rs.* 2,40,30,000; and for the five ending with Fusly 1244, to *Rs.* 2,25,50,000; but if Tanjore be excluded, the result of the comparison will be still more discouraging.

	Rs.
Average collections from Fusly 1210 to 1214 - - - -	2,14,10,000
From 1240 to 1244 - - - - - - - - - -	1,89,50,000
In the first five years, the average produce of Tanjore was, Cullums	94,19,689
In the last - - - - - - - - - - - -	1,31,70,125
Increase - - - - - - - -	37,50,436
	39¾ per cent.

The fluctuations in the produce during the first period were between 100 and 57; in the last, between 100 and 95¼.†

39. It has been stated that the revenue in two of the talooks in South Arcot (Manargoody and Chillumbrum) was increased in six years from *Rs.* 1,81,180 to 2,90,605, in consequence of the attention paid to the irrigation works, principally by the construction of an annicut across the Colleroon. That work cost *Rs.* 1,64,756; it came partially into operation in Fusly 1245, and up to Fusly 1249 the increase attained in South Arcot alone has been 1,38,129, independently of the benefits derived in Tanjore; so that the work has already more than paid for itself.

40. It is clear from these facts, that whenever the Government are compelled, by want of an adequate establishment, to postpone the execution of any similar work, they lose hundreds in revenue for every rupee that is saved in charges. At present there are urgent applications from several Collectors for Engineers, to report upon important projects, which cannot be complied with; and if those which have been enumerated in this paper should be found feasible, and promise large and immediate returns, they cannot be undertaken for want of competent Superintendents.

41. When it is considered that the districts of this Presidency are, upon an average, from 100 to 120 miles in length, by 80 or 100 miles broad, that each of them contains from one to three thousand works of irrigation, scattered in different directions, independent of roads, bridges and public buildings, and undergoing an annual expenditure of a lac of rupees, it is evident that there can be nothing like effective superintendence of public works, unless there is an Engineer attached to each; and as this officer must make plans and prepare estimates for every work, and keep a diary of all his proceedings, which must be copied in duplicate or triplicate, either he must go through this mechanical labour himself, and neglect his own important duties, or he must be allowed a suitable establishment for them.

42. Under the present arrangement of the department, the Assistant to the Civil Engineer, a commissioned officer, who has had a costly education and receives a high salary, and a Surveyor, whose pay is *Rs.* 175 a month, are "employed in making two copies of their own diaries,

* That is, in the 12 irrigated Ryotwar districts; viz., Nellore, Bellary, Cuddapah, Chingleput, North Arcot, South Arcot, Salem, Tanjore, Trichinopoly, Tinnevelly, Madura, Coimbatore.

† As the revenue of Tanjore fluctuates with prices, the produce has been taken as a test of the prosperity of the district, instead of the collections. The collections in that part of the district which is not influenced by prices have increased in nine years, viz., from Fusly 1240 to 1248, from *Rs.* 9,62,385 to *Rs.* 10,43,343.

diaries, which could be done by men on *Rs.* 20; and an experienced Surveyor, capable of planning works, is employed in copying plans of tunnels and cutcherries, which require no thought or ability, and for which men could be obtained at one-third of the cost;" all this is in violation of an acknowledged principle, that it is waste of money to employ any person in doing duties that can be done by others at a less cost; such a violation would never be thought of in any other department; no European assistant who receives a salary of some hundred rupees a month is ever employed either at the Presidency or in the provinces in copying papers.

43. I have heard an opinion broached, that although the neglect of the works of irrigation is a cause, yet it is far from being the principal cause of the decline in the land revenue; that bad seasons, defective revenue arrangements and management, the ruin of the foreign trade, the corruption of the native revenue servants, and heavy assessments, have more to do with the defalcations than want of water.

44. But the conclusive answer to this is, that wherever there is abundance of water there is no want of revenue, that Tanjore and all those parts of the southern districts which are watered from the rivers of the S. W. monsoon, are in a most flourishing condition, the land saleable and the people comparatively wealthy.

45. How does it happen that Tanjore, which depends almost entirely for its food and its revenue upon artificial irrigation, is the only one of the 12 Carnatic districts that is in every respect steadily advancing in prosperity? Its assessment is not a jot lighter than that of other districts,* and it is open to all the evil influences which are supposed to retard the general prosperity. It is assuredly its never failing supplies of water that give it this advantage; an advantage which, when the revenue was levied in kind and absorbed one-half of the produce, enabled the Ryots to preserve their lands as a valuable private property.

46. I believe it will be found that "foreign trade" has reached its extreme point of depression, that the native manufacturers are beginning to lift up their heads, and, from the facility with which they imitate European patterns, it seems probable that, if machinery were introduced amongst them, India would again become an exporting nation: I am not aware that there is a single district in the Madras territory which is over assessed, though there may be some particular tracts which require reduction.

47. Of corruption and embezzlement there is, no doubt, abundance; but if the land was well watered instead of being parched by drought every five or six years, there might be as much corruption, but there would certainly be more revenue, and more left to the producers of revenue. People do not die of famine because European cloth is used instead of country, but simply because the land, for want of water, will not yield its produce.

48. It seems to me, therefore, advisable that the Board of Works should be called upon to report upon Captain Cotton's suggestions. The works which he has proposed will, if practicable, be of the highest benefit to the country; and the vast advantages which have been already derived from the upper and lower annicuts, works which were entirely planned by him, entitle his opinions on the subject to particular respect. It is satisfactory to know that, after some of the heaviest freshes that have ever been known in the Cauvery, no damage whatever has been done to the banks of either river; on the contrary, the Civil Engineer reports that Tanjore was never so free from breaches as it has been this year. Many things, he says, have now been proved which were before considered doubtful: "The fear that the beds of the rivers were rising by the influx of sand, caused by the upper annicut, is one of them, for had that been the case we must have found the embankments too low for such a flood as this, and breaches would have been the sure consequence. No alarm need now be entertained from the increased body of water thrown into the Cauvery by the annicut, for it is evidently more than counteracted by the sluices and calingulas of discharge; and I am fully satisfied that these minor works, acting in concert, regulate both the water and the sand, and give all the control necessary for the safety of the country in floods, and the supply of the irrigation, and that no further works whatever, for any general effect, are necessary."

See letter from Civil Engineer, Fifth Division, to Board of Works, 10 August 1840.

49. One of the projects suggested by Captain Cotton has, I observe, been partially investigated, and the result is highly encouraging. A former Collector of Trichinopoly, Mr. Nelson, has the merit of having first drawn attention to the great reservoir, called the "Ponairy." This was in 1832. He stated that 20,000 cawnies might be cultivated if that work was restored; no notice, however, appears to have been taken of this representation, and it was not until 1836 that the project was revived by Captain Cotton, in the report which is now under consideration.

50. In 1837, a partial survey of the old work was made, and its prosecution strongly recommended by the Engineer officer of the division, Lieutenant Ditmas, and the then Collector, Mr. Blair. Three years more, however, were suffered to elapse without any measures being taken to forward it, when the subject was again urged upon the Board of Works by the present Collector. He stated that the Ryots of the Woodiarpolliem Talook alone "were

* This is a mistake; the revenue assessment in Tanjore is very much lighter than in almost all other districts.—*P. W. Comrs.*

Appendix (L.)

" were willing to undertake the cultivation of 9,000 cawnies, which would yield a revenue of between 80 and 90,000 rupees, but that this did not at all approximate to the whole quantity which might be brought under cultivation. In Arinlore, there would be a great increase."

51. The Board, upon this urgent representation, ordered the Engineer, as soon as his other duties would permit, personally to examine the project, which they said appeared to be of vast importance; but the other duties of the Engineer are so heavy as to make it impossible for him to give immediate attention to the work; and, unless he is assisted, there is no chance of anything being effectually done. Here is a striking instance of a project, allowed by all the authorities to be of great importance, being suffered to linger for years for the want of an efficient establishment. A tenth of the revenue that has been lost from the neglect of this project, in the eight years that have already elapsed since it was broached by Mr. Nelson, would have paid for such an increase in the establishment as is required. As another instance, I may mention that a survey was in progress for restoring works upon the Pennaar River, in South Arcot, upon which an increase of a lac of rupees to the revenue depended, when the Surveyor was taken away to survey some pasture lands in Mysore, which had been appropriated for the public cattle.

52. I think, therefore, that the Board of Works should be instructed to report without delay what addition will be required to the Civil Engineer's Department to enable it to carry out all the important works that have been suggested within the last few years, should they upon a careful investigation be considered feasible, viz.:

1st. The complete irrigation of the districts of Rajahmundry, Guntoor, and Masulipatam, from the Kistnah and Godavery, and a canal of communication from the latter river to the Pulicat Lake.

2d. The construction of an annicut across the " Palaar," with all the necessary subordinate works. The restoration of the " Poonairy," upon the plan suggested by Captain Cotton.

3d. The restoration of the annicut across the Cauvery, at " Nerinjepett," and the execution of canals from that river, to be carried through the districts of Salem and Coimbatore, upon as high a level as possible.

4th. A canal from the lower annicut across the River Vellaur, for filling the great tanks of Wallajah and Peroomalairy, in South Arcot.

5th. The diversion of a stream, which now runs waste to the westward, into the River " Noel," in order to afford adequate supplies of water to the extensive cultivation under that river.

6th. The construction of a series of reservoirs on the hills, for storing up the surplus waters of the S. W. monsoon, which now run waste.

53. Many of these works are indicated in the accompanying skeleton map. It was long ago recommended by Colonel De Havilland, an officer of the highest talent and most extensive experience, that this Government should not cease in their efforts to improve the irrigation of the country until they had turned to account all the water which now rolls in volumes to the sea, by the rivers which intersect the Peninsula; and he proposed to effect this object by excavating extensive canals, which should serve at once for purposes of irrigation and communication.

54. This recommendation has its foundation in the fact, that our provinces prosper or decline, according to the supply of water which they receive. Tanjore, Malabar and Canara are liable to all the incidents which affect the welfare of the other districts, with the important exception of water, of which they have always abundance, the former by artificial works, the latter from the natural rains; in them, therefore, famine and all its concomitant evils are unknown, and in point of agricultural wealth they will bear comparison with many parts of Europe. No year passes without our having melancholy experience of that contrast which is afforded by the state of the other districts.

55. I must again recur to the fact, that the revenue in two talooks only, in South Arcot, last year, was *Rs.* 1,30,000 above the average revenue, before the lower annicut was constructed. As Tanjore has always been fully cultivated, the effects of the upper annicut upon the revenue of that province are not so easily made matter of account; that they are of the highest importance, however, is evident from the fact stated by the Civil Engineer, that the river in this season has been " so exceedingly low " as to require the retention of the whole quantity for cultivation. But for the annicut, a large portion of it would have run waste to the sea. All that came into the river has been kept up by the annicut, and turned upon the land, and lacs of revenue thereby saved.

56. It is plain from these facts, that an increased expenditure upon the Engineer Department would be the sure means of filling the public treasury. I am persuaded therefore, that the attention of the Government cannot be directed to a subject of greater importance, and that it would be wise, without delay, to investigate it thoroughly, with a view to the undertaking of all such works as promise results equal to what have followed from the construction of the annicuts in Tanjore.

5 September 1840. (signed) *J. Sullivan.*

Since

Since the preceding sheets were written, the report of the Collector of Tinnevelly upon the settlement of that district for Fusly 1248 has been submitted. It appears that the revenue lost in that year from deficiency of water in the Nunjah lands alone, was *Rs.* 1,58,471. This example is of itself sufficient to show how necessary it is to the finances of Government, that every effort should be made, and made without delay, to put the works of irrigation in the most efficient state; particularly that we should take measures for storing up the water which now runs waste at one season of the year, in order that we may have the means of making up for deficient supplies at other seasons. Appendix (L.)

The Collector says, that the early part of the season was so favourable as to induce the Ryots greatly to extend their cultivation, but that a failure in the river supplies at a later period, destroyed their hopes and their property; so that instead of an increase in the revenue of Fusly 1248, over that of Fusly 1247, of *Rs.* 1,22,767, which would have been realized if the water had sufficed for the cultivation, there was a net decrease of *Rs.* 26,259.

In the worst years there are some days in which there is such a glut of water as would admit of a quantity being stored up in reservoirs on the hills for use, when the harvest is placed in jeopardy by drought below. In the Cauvery, this year, there was at one time so little water, that unless the new annicuts had turned all that there was upon the land, the crops in Tanjore, Trichinopoly and South Arcot would have been ruined; while at another period of the season there was such a flood as has not been known for many years. The construction of reservoirs on the hills (where the rivers have their sources), is a new feature in the irrigation system of India, although such works are made in parts of Russia for assisting the navigation of rivers. It will be seen from the accompanying papers, that reservoirs capable of containing many million cubic yards of water may be constructed on the hills at an expense from *Rs.* 4,000 to *Rs.* 5,000.

I find upon referring to the accounts, that I have greatly understated the financial benefits that have already been derived from the construction of the lower annicut. That work has cost *Rs.* 1,85,000, including repairs, and locks, &c., constructed for the improvement of navigation; the increase of revenue from the works in Fusly 1245, the first year that it came into operation, was reported by the Collector to be, *Rs.* 50,000; in the two followng years it yielded an increase of *Rs.* 75,000 per annum; and in Fusly 1248, the increase upon the average revenue was, *Rs.* 1,38,128; the total increase therefore has been *Rs.* 3,50,000, or nearly double the amount of the expenditure.*

But a much larger increase is expected when all the channels of irrigation from the annicut are perfected, the embankments of the river completed, and a general system of drainage established. I am informed by the Civil Engineer of the division, that "the delay which has occurred in extending channels to distribute the water" has been a most serious loss; nearly all the waste land would have been cultivated this year had they been done. This comes from having an inefficient establishment, and is an additional proof of what I have stated, "that Government" lose thousands in revenue, when they save ten by keeping the Civil Engineer's Department below its proper level.

10 September 1840. (signed) *J. Sullivan.*

Appendix (M.)

Appendix (M.)

LETTER from the Madras Military Board to the Governor in Council of *Fort St. George*, recommending some changes in the official practice of the Board, with the view of expediting business, dated 29 September 1840.

My Lord,

1. WE have the honour to acknowledge the receipt of the extract from Minutes of Consultation, No. 3,244, dated the 25th ultimo, communicating a draft of a proposed General Order, for the purpose of our submitting any suggestions that may occur to us as calculated to promote the object of that order.

2. We are fully sensible of the advantages that would result in the transaction of public business, from such a modification of the existing course of procedure as would diminish the frequent and troublesome references to Government, without weakening the efficiency of that wholesome check and control which is necessary to prevent an unprofitable expenditure of the public funds, and the subject has often engaged our serious attention.

3. It appears to us, that the extremely desirable object contemplated by Government, will be only partially attained by the operation of the order which has been referred for our consideration; for it is not the correspondence connected with the submission and sanction of bills that chiefly occasions the endless references to Government, which consume so much time

* In the N. W. parts of this district (S. Arcot) there are 612 tanks; the assessment of the land under them which is capable of cultivation is - - - - - - - - - - - - *Rs.* 2,64,960
Revenue - - - - - - - - - - - - - - - - 1,07,974

Difference not cultivated for want of water - - - 1,56,986

Appendix (M.)

time and labour that might be more usefully employed, but the transmission of estimates and applications for the authority of Government required by the present regulations before disbursements can be incurred, even in cases where the necessity and expediency are acknowledged by all.

It is now the practice in the Building Department, to submit every estimate, and in other branches of the service to apply for the sanction of Government, previously to authorizing any disbursements, however small and indispensable they may be. In cases of emergency it is true, this Board is permitted to authorize the commencement of repairs and the expenditure of money, within a limited amount, when delay would be prejudicial to the public interests, but this in no way diminishes the correspondence, as the sanction of Government must still be applied for and obtained.

4. In the Building Department there are certain repairs required periodically, such as cleansing and white-washing, repairs to the roofs and floors of barracks, which are indispensably necessary for the preservation of the buildings, the comfort and health of the troops, or the security of public property. The necessity of such repairs being admitted, little good is likely to result from submitting the estimates to Government, who cannot effectually check them, while inconvenience and loss not unfrequently arise out of the delay of doing so. These repairs, to be executed efficiently and economically, must be commenced at the proper season, materials being previously prepared; and as delays often unavoidably occur in obtaining from subordinate departments and officers satisfactory explanations on doubtful points, which are farther prolonged by the required references to Government before even the preparation of the materials can be authorized, it often happens that the best part of the working season has passed before the repairs are undertaken, while much time and labour have been spent without any corresponding advantage.

5. In like manner in other departments, either the sanction of Government must be frequently anticipated, or the service suffer inconvenience and loss.

6. In Bengal the Military Board authorizes all ordinary repairs to public buildings, roads, and embankments, without any previous reference to Government, submitting only periodical statements of the number and amount of the estimates so authorized; and the Board of Revenue, in the Department of Public Works at Madras, sanctions in like manner, the ordinary repairs to Maraumut works at this Presidency.

7. We would therefore beg to suggest that this Board, as in Bengal, be authorized to sanction all periodical and trifling repairs to public buildings, roads and bridges at the Presidency, and within the limits of military cantonments; submitting to Government at the end of each quarter, a statement of the number and amount of the estimates sanctioned during the quarter, and at the same time bills in detail of all the disbursements actually incurred during the same period, for the final sanction of Government.

8. We are of opinion that in the Building Department at least, Government should not in any case dispense with the submission of the bills of actual disbursements in detail for its final sanction, and it appears to us highly expedient that all expenditure should, in some stage of its progress, either before its commencement or on its termination, be submitted in detail to Government for its control and sanction; for it is a generally recognized fact, that disbursements which are to be laid before Government, are usually managed with more attention to regularity and economy than such as require only the sanction of subordinate authorities.

9. It is not intended by this modification to relax in any degree the scrutiny and check to which estimates and disbursements are now subjected before being authorized; but to transfer that check from Government, which cannot efficiently exercise it, to this Board; which has the means of doing so, and on which the responsibility will devolve, as it ought to do, that no repairs are sanctioned which are not in reality required. Estimates will, as at present, be called for from Superintending Engineers and Staff Officers, and be carefully examined in the office of the Chief Engineer; the buildings will be surveyed both before and after the execution of repairs, and precisely the same course of scrutiny and control followed, only they will not be submitted for the sanction of Government before being authorized.

10. Estimates for new buildings and for additions and alterations to existing buildings, as well as for extensive repairs, such as the renewal of roofs or floors, will continue to be submitted for the special approval and orders of Government; and if thought necessary, of ordinary repairs also, when they exceed *Rs.* 1,000, although no such restriction exists in Bengal.

11. Should your Lordship in Council deem it right to sanction the proposed extension of the Board's authority, the same system will exist at this Presidency as was established a short time ago in Bengal for reasons similar to those which we have now stated; but with the additional control that bills in detail of all disbursements, however trifling, will be laid before Government quarterly for its final sanction, which we are of opinion will prove a useful check on unprofitable expenditure. In Bengal, statements only of the authorized estimates are forwarded to Government, and the bills afterwards passed by the Military Board, if they do not exceed the amount of their estimates more than 10 per cent.

12. For the same reasons we are of opinion that it would prove advantageous were we entrusted

entrusted with the authority of sanctioning the entertainment of additional artificers in the Gun Carriage Manufactory to the extent of *Rs.* 150 per mensem, and in arsenals to the amount of *Rs.* 75, when extra work is required to be performed in these establishments; and advances for forage for mounted corps, when ordered to march, not exceeding *Rs.* 500; bills with explanatory remarks being submitted at the end of each quarter for the final sanction of Government. Appendix (N

13. As a further check on the tendency which all disbursements and establishments have to increase, annual statements of the expenditure in the Building and Ordnance Departments, arranged under the distinct heads of what has been incurred with the sanction of Government previously obtained, and what has been authorized by the Military Board, may be submitted to Government; who will thereby have the means of exercising a far more efficient control over the general disbursements than it now possesses, by comparing the expenditure of different years, and requiring explanation wherever an unaccounted for increase appears in any branch.

14. There is one other point to which we would wish to solicit the attention of your Lordship in Council. In cases of advances required for buildings and repairs sanctioned by Government; these are at present restricted by Regulation, when the estimate exceeds *Rs.* 800, to one-third of the amount when the work is sanctioned, another third, when the walls are raised, and the remaining third when the work is finished. A strict adherence to this rule is frequently attended with inconvenience, and leads to much correspondence, which would be obviated by this Board having the discretionary power when the estimate does not exceed *Rs.* 5,000, of authorizing the whole or such part of the amount as shall appear necessary, on a consideration of the season of the year or the distance of the station from the Presidency. On many accounts this authority would be attended with benefit to the service, and assist us in diminishing our clerical labour.

15. The modifications now suggested in conjunction with the proposed General Order which we have the honour to return, having added a few items to the list of subjects, comprize all the alterations which we feel justified in proposing at the present moment, for expediting and improving the transaction of public business.

Appendix (N.)

EXTRACT from a Letter from Mr. *Norfor*, Manager of the Porto Novo Iron Works of the Indian Iron Company, to the Public Works Commissioners, dated 27 September 1851. Appendix (

3. THE canal running from the lower annicut to Porto Novo is of the utmost importance; and since the construction of the annicut, it is indispensable, as forming the communication between Porto Novo and the districts of Coimbatore, Salem, Trichinopoly and Tanjore. But I regret to say it has not answered the expectations that were formed of it. The Indian Iron Company having considerable traffic on this canal have, in consequence, been frequently forced to make representations to the authorities regarding it; and I fear have often been considered very troublesome. It has been remarked, that it is impossible that the Government can make any considerable improvements, as the traffic on the canal is not in general of sufficient importance beyond the interest of the Iron Company. I am ready to admit this argument, just now, as correct. The canal in question is principally used by the Iron Company; but the reason is that no private individual will take the risk of navigating it, and the Iron Company would not either do so, only that they are forced to do so as their ore and charcoal supplies all come from the banks of the Cauvery; it is therefore the only route they can take, since the construction of the lower annicut, which bars the passage of the boats in the direct line of the river to the sea coast.

4. The reason that this canal does not come into more general use is, because no dependence can be placed on it. Boats go up to fetch produce, but are by no means certain when they may be able to return.

5. The canals run through the richest talooks of South Arcot, yet every bag of rice or paddy is brought into Porto Novo on bandies; a few boats do attempt the passage, but from the great difficulty of the navigation of one part of it, the full development of its utility is entirely impeded.

Situated as Porto Novo is, and this canal in efficient order, it would be a large grain exporting port; which is not the case at present, solely because the communication with some of the richest rice grounds is almost impracticable.

6. The land is impassable, and the roads are not much better in wet weather; the consequence is, the Collector has much trouble in collecting the revenue, because the paddy is stored in the field, whereas, with a more easy mode of transit, it would be immediately forwarded to a market. You may perceive from what I have stated, that independently of the Iron Company, a very considerable extent of trade would pass by this canal if it was in efficient order.

Appendix (N.)

7. I will now point out the difficulties experienced in its navigation, and suggest some improvements that may be made. With regard to temporary repairs and assistance, I cannot avoid expressing my sense of the considerate attention we have always met with from Captains Lawford, Bean and Ludlow, who have always done everything in their power to assist the passage of our boats, and as they are well acquainted with the defects of this canal they will be better able to correct and improve on my remarks.

8. You are doubtless aware that the canal in question runs from the lower annicut into the Veeranum tank. On that tank at Lallpett are two locks for the purpose of letting the boats down into a cut called the "Velikall" which joins the old canal about 2½ miles to the eastward. This old canal then runs on some 30 to 35 miles, to Porto Novo, where the boats are again let down into the Vellaur river by another lock.

9. There is abundance of water in all other parts of the canal except in this branch called the "Vellikall," and about two miles or so beyond it; that is, a boat can go through the Porto Novo lock laden to draw 2½ feet of water, and she will proceed without any considerable obstruction until she arrives in or near the "Vellikall" branch; on approaching that branch, she meets with shoals and banks, and after entering the "Vellikall" will ground, and probably in some places find only 10 inches of water as she approaches the locks. The same happens with boats laden and coming down; they get from the lower annicut to the Lallpett lock very well; but on arriving there, they find as before, only 10 inches of water in this end of the "Vellikall," although there is quite sufficient in the old canal below.

10. This usually causes a detention. Should a slight fresh occur, they pass through the lock gates and wait in the pond below, keeping ready; when, if the lock-keeper is willing, he watches his opportunity, opens the sluices and admitting a rush of water into the "Vellikall," the boats are regularly washed down into the old canal, and with them, of course, a plentiful deposit of mud to form shoals and banks. On very desperate occasions, we construct a dam across the "Vellikall" and float the boats down to it; then remove the dam and float on to another. All this, you must be aware, is attended with great trouble and expense, and no private traders would do it. When the boats are once in the old canal they get easily down to Porto Novo.

11. The conclusion I come to from this state of things is, that the difference of level of the bed of the old canal and the floor of the second lock on the Veeranum, is so great as absolutely to require one or two extra locks between these points. This done, and the lock at Porto Novo lengthened, I see no reason why the canal then should not be thoroughly efficient, and I am sure it will be extensively used.

12. Some regulations are required regarding the management of the calingulahs and sluices of the canal; as I have observed a most wanton and culpable waste of water, from the natives neglecting to shut them at proper times. I have repeatedly observed it, but it seems impossible to fix the responsibility on any party. I would suggest that a guard be placed over each sluice or calingulah, and that he should be well paid and severely punished on the slightest neglect.

Appendix (O.)

Appendix (O.)

LETTER from Military Board, Calcutta, to Military Board, Madras, dated 22 June 1852; as to the mode of sanctioning Estimates for Repairs, and Bills for Work done.

I AM directed by the Military Board to acknowledge the receipt of your letter, No. 3305, dated the 1st current, and to submit the following replies to the questions put:—

Query 1st.—Are bills for works in the Engineer Department executed on Government sanctioned estimates, which do not exceed or only slightly so, and to about what extent their estimates passed by your Board without further reference to Government, and if so under what authority?

Estimates for new works in the Engineer Department are without exception submitted to Government for sanction. The Bills for the same, if less in amount than the authorized estimate, or not exceeding the estimate by more than 5 per cent., are passed by the Board under the orders cited in the margin,* of which copies are annexed, and sent to the office of the Accountant Military Department, for adjustment. Bills if more than 5 per cent. in excess of the estimates are submitted to Government for orders. Estimates for repairs in the Engineer Department are disposed of in the same way as estimates for repairs in other departments; see reply to 4th question.

* G. O. G. G. 17th July 1819, Secretary to Government, Military Department, Letter No. 9, dated 14 March 1842.

Query 2d.—If bills are so passed, to whom do the Board report the transaction?

A quarterly report is made to Government of bills passed by the Board in excess of estimates, under the order noted in the margin.†

† Government Order, Military Department, dated 12 January 1830.

Query 3d.

Query 3d.—Is any notification made to the Accountant-general of bills having been passed by the Board? Appendix (O.)

When Bills are audited by the Board they are sent for adjustment to the respective offices of account. The Board make no further report, beyond informing these offices that the bills have been passed.

Query 4th.—Are ordinary repairs executed without the sanction of Government, and are bills of this nature passed by your Board without reference to Government?

Ordinary repairs are executed without requiring the sanction of Government; the bills are also passed by the Board without reference to Government.

Ordinary repairs in this Presidency are classed under two heads. Ordinary annual and ordinary petty or contingent. With regard to the former, at the commencement of the working season, Government places, on application, at the Board's disposal, an advance equal to the average expenditure of three years, to enable the Board to order advances on the passed estimates for the usual annual and quadrennial repairs; the office of account granting the requisite assignments on the orders of the Board. Petty repairs are usually charged in monthly current expense bills, and are executed from advances granted separately by Government.

Extract from the Proceedings of the Right Honourable the Governor-General in Council in the General Department, under date the 12th January 1830, No. 265, referred to in the foregoing Letter.

Read an extract from the proceedings of Government in the Military Department, dated 1st instant.

Resolution.—The Governor-General in Council sees no objection whatever to the arrangement adopted in the Military Department being acted upon also in the General, Commercial, and other departments. But it will be necessary that registers or notices of the bills passed in each department should be submitted periodically for entry on the proceedings of Government and for notice in the general letters addressed to the Honourable the Court of Directors.

Extract of Government Order, dated 17 July 1819, referred to in the foregoing Letter.

9. When the repair or erection of any particular building shall have been completed, the Executive Officer is to send a bill for the same, through the Superintendent, to the Military Board for audit; and if the amount of the bill does not exceed the estimate, the Board is authorized to pass it without reference to Government.

Extract from the Resolution of the Supreme Government, dated 14 March 1842, referred to in the foregoing Letter.

In modification of the resolution in the General Department, dated the 12th January, 1830, his Lordship is further pleased to determine that 5 per cent. shall be the limit in future, instead of 10 per cent., up to which expenditure in excess of estimated cost may be passed by the Military Board, when such excess is satisfactorily accounted for to that authority.

Appendix (P.)

Letter dated 10 April 1852, from Mr. *G. W. Boothby*, Superintendent of the Aska Sugar Works in the Ganjam District, respecting the very bad state of the Roads of the District, and the positive Injury thence accruing to Trade; addressed to Messrs. Binny and Co. of Madras, and communicated by them to the Public Work Commissioners. Appendix (P.)

Dear Sirs,

As it is reported that Government objects to sanction the bridging of the rivers on the line which has lately been surveyed for a road in the Ganjam District, and as Commissioners have been appointed to inquire into the superintendence and execution of Public Works in the Madras Presidency, it appears to me that the time has now arrived when it is incumbent upon us to take some steps with the view of bringing prominently to the notice of Government our position in the Ganjam District, with reference to the impossibility of transporting our large and valuable stocks of produce to the coast during five months of the year, and the consequent very serious loss to which we are annually subjected; also the great difficulties we have had, and still experience, in procuring an adequate supply of raw material for our sugar works, owing in a great measure to the entire absence of roads throughout the district, and the consequent great impediment to the transport of produce from the various

Appendix (P.)

parts of it to our works, which of course must act as a check to an extended cultivation of the sugar-cane.

2. In order that I may state facts that have actually occurred, I will now mention the leading circumstances of our operations last year.

The total sum expended by the Aska establishment in the purchase of raw material during the year 1851, though greatly in excess of what we had in any other year been able to expend, does not represent more than one-third of the quantity necessary for the full supply of our works, and yet for years past there has been on our part an urgent demand for the produce of the sugar-cane, at a rate allowed by the sellers to be highly remunerative to them. We having, four years ago, fixed the price, at a sacrifice of immediate gain, with the view of so greatly benefiting the producer as to induce an extended cultivation, and though since that time our sugar has fallen in price fully one-fourth, we have not made the slightest alteration in the favourable rate allowed to the producer of the raw material. In our neighbourhood this measure has been attended with the desired effect; but the entire want of roads prevents an extended cultivation of cane in parts distant from us.

3. For the full yearly supply of our sugar-works six lacs of rupees worth of raw material are required, and to this must be added another lac of rupees for current expenditure in connexion with manufacture, &c. which would bring the amount distributed in the district from our sugar-works alone, independently of our large purchases in other articles, to seven lacs of rupees; more than half the total amount of revenue collected in the Ganjam District. Roads and irrigation works would speedily bring about this state of matters so desirable both for ourselves and the Government. Even with these necessary aids to commerce it may be doubted, looking to the great competition that is now arrayed against India from the Brazils, Cuba, and especially the beet-root sugar of Europe, whether the sugar trade of India can continue to exist; but without such aids it cannot be expected that we can compete with countries in which all advantages that can be derived from facilities of communication are enjoyed.

4. I now come to the most important point in connexion with the subject under consideration; namely, the question as to the necessity of bridging the rivers along the extended line of road in the Ganjam District. I will in reference to this matter also, again state facts that occurred last year.

We commenced manufacturing sugar early in March 1851, and finished in September. We carted to the coast before the setting in of the rains 700 tons of sugar and 150 tons of rum. During the early part of the rains, that is, from the middle of June till the middle of July, we were able, owing to the heavy rains setting in unusually late, to send to the coast 300 tons more of sugar and 50 tons of rum. It was accomplished with great difficulty and expense, and at great risk; but having a vessel waiting for cargo at the time, I was compelled to make the attempt. From that period to the end of November the country was quite impassable for carts laden with produce perishable by contact with water, we were therefore unable to get the remainder of our produce (nearly half of the whole year's manufacture) to the coast before the end of December, as we could not commence sending it off until late in November; and from there being no road, though the distance is only 34 miles, the process of transporting a large quantity of produce is exceedingly tedious. Under the most favourable circumstances, a cart carrying half a ton of sugar takes three days to perform the journey to the coast, at a charge of rupees 2½; but the average time occupied is about six days, and often eight or ten days. So that taking the year throughout, that is, the seven months during which it is possible to send our produce to the coast, carts occupy an average period of at least 12 days in performing the journey to and from the coast, the entire distance traversed being under 70 miles.

5. It must, therefore, be apparent that at the best of times the difficulty and delay in getting our large quantities of produce to the coast are very great. A road even without bridges would, of course, remedy this evil during the seven months mentioned; but unless every river and nullah is bridged, a road will be utterly ineffectual in removing the great obstacle of which we have to complain, namely, our valuable produce being shut up for five months of the year. When our sugar-works are at full work, the value of the property on the spot thus locked up would reach four lacs of rupees; and considering the great and direct aid which our operations afford in the collection of revenue in the district, in proof of which I will only mention that at the commencement of last month our advances on the cane crop of the present year amounted to *Rs.* 3,50,000, for which no return had been received, the whole amount having been advanced from time to time since October last to enable the Ryots to pay their kists as they became due; considering this, I say, it is surely not expecting too much to seek for the removal of the serious obstacles to the commercial prosperity of the district under which it has so long laboured.

6. To argue that there is no necessity for bridging the rivers, because there is no traffic during the rains, when it is well known that traffic at that period is impossible, on account of those rivers, is surely a strange mode of reasoning. It is true that the rice crop, which for many years constituted the principal article of export, is gathered in during the months of December and January, at which time carts can traverse the country, and once a year, during the months of April and May, a few dhonies have come to take rice and other articles away; but it cannot be supposed that no other than so primitive a method of trading would exist, if facilities of communication with the coast at all seasons of the year were afforded.

afforded. At all events, we can safely answer for the great benefit that would be conferred on by far the most important branch of trade in the district, by a road from the interior to the coast, traversable all the year round.

7. I have, in the foregoing observations, confined myself to our transactions in the district in connexion solely with our sugar-works; but it must not be forgotten, when urging our claims for the consideration of Government, on the plea of the extent of our transactions being highly beneficial to the district, and having a tendency to ameliorate the condition of the people, that we have every year been large purchasers in various other articles, such as rice, oil-seeds, turmeric, hides and horns, &c., in all of which you are well aware how our transactions have been impeded and restricted by the difficulty and cost of transport to the coast. It cannot, therefore, be doubted, that with facilities of communication, all branches of trade would greatly increase, and that new ones would spring up. Cotton and indigo, for instance, to the former of which we have already turned our attention, might, I believe, be cultivated with advantage, if facilities for exporting the produce were afforded. Indeed, the district is rich in natural resources, but sadly poor in the means for their development.

I am, &c.
(signed) *G. W. Boothby.*

P. S.—Since writing the above, your Mr. Bell's letter of the 6th has come to hand, enclosing a letter from Messrs. Scott, Bell & Co., of London, in which those friends state that the sugars ex "Phœbe Dunbar," the vessel mentioned in this letter as having been waiting for cargo in the month of July 1851, and on board which the 300 tons of sugar, dispatched to the coast with so much difficulty during the early part of the rainy season of last year, were shipped, have turned out very badly, being valued at 2*s.* 6*d.* per cwt. less than those of the same description ex "Ramillies;" which, allowing 1*s.* per cwt. for fall of price since sale of sugars ex that vessel, shows a lower valuation by 1*s.* 6*d.* per cwt. Now, as far as my knowledge goes, this can only be accounted for by the circumstances under which I was obliged to send this sugar to the coast; the carts taking it were often 12 or 15 days on the road; they had to be carried across rivers, one by one, on small canoes, and had frequently to wait beside nullahs for days (exposed, of course, at times to heavy rain) until the water ran off; so that it can hardly be wondered at that the sugar should have received damage. We are, therefore, not only subjected, from the want of means of communication with the coast, to heavy loss from the locking up of our produce, but also to having it damaged, when obliged, as may often be the case, to sent it to the coast just before the country becomes quite impassable for carts, in order to save ourselves the payment of heavy demurrage for keeping a vessel waiting on the coast beyond the time stipulated. This year, again, and the year following also, unless such measures are very speedily carried out as will give us the means of communication at all seasons with the coast, we must make up our minds to a continuance of the serious impediments and losses in our commercial operations in the Ganjam District, of which, I think, it must be allowed we have just cause to complain.

(signed) *G. W. B.*

Appendix (Q.)

STATEMENT, showing the REVENUE from IRRIGATED LAND in the *Tinnevelly* District, for the Twenty-nine Fuslies, 1232 to 1260, and the EXPENDITURE on IRRIGATION WORKS in the same District for the Thirty Years, 1821 to 1850.

NUNJAH REVENUE.				EXPENDITURE ON IRRIGATION WORKS.					
Fuslies.	Total Net Irrigated Revenue.	Average of each Five Years.	Amount of Arrears struck off in each Year as irrecoverable.	Years.	Ordinary.	Occasional.	Emergent.	TOTAL.	Average of each Five Years.
	Rs.	*Rs.*	*Rs.*		*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*
				1821 -	11,187	- -	433	11,620	
1232 -	11,92,522		9,196	1822 -	12,305	- -	2,445	14,750	
1233 -	11,70,323	11,54,217	21,373	1823 -	15,332	- -	4,530	19,862	23,199
1234 -	11,02,772		11,481	1824 -	15,364	- -	4,018	19,382	
1235 -	11,51,253		21,211	1825 -	44,967	3,814	1,604	50,385	
1236 -	10,24,361		27,418	1826 -	31,813	2,087	1,960	35,860	
1237 -	9,00,495		17,546	1827 -	51,666	308	17,126	69,100	
1238 -	10,09,456	9,67,766	16,249	1828 -	37,996	129	2,885	41,010	41,387
1239 -	9,74,482		25,445	1829 -	22,037	7	1,771	23,815	
1240 -	9,30,036		24,032	1830 -	35,019	329	1,805	37,153	
1241* -	5,79,956		22,300	1831 -	42,024	421	693	43,138	
1242 -	9,04,383		14,208	1832 -	45,229	449	2,170	47,848	
1243 -	10,59,716	10,03,088	10,016	1833 -	41,117	28,676	1,691	71,484	43,884
1244 -	10,65,204		18,337	1834 -	23,407	483	1,168	25,058	
1245 -	9,83,048		14,317	1835 -	26,903	2,599	2,389	31,891	
1246 -	10,30,915		8,269	1836 -	33,812	- -	4,457	38,269	
1247 -	11,55,184		5,482	1837 -	36,286	10,252	4,893	51,431	
1248 -	11,32,555	11,21,921	10,958	1838 -	34,239	25,108	3,344	62,691	56,279
1249 -	12,38,502		5,956	1839 -	39,837	19,101	2,560	61,498	
1250 -	10,52,450		7,267	1840 -	48,432	14,217	4,859	67,508	
1251 -	9,63,585		4,894	1841 -	31,271	10,351	6,747	48,369	
1252 -	9,73,212		4,559	1842 -	32,603	5,251	6,458	44,312	
1253 -	11,18,322	11,32,475	1,934	1843 -	33,329	2,150	2,540	38,019	41,033
1254 -	12,11,007		1,214	1844 -	38,993	4,030	837	43,860	
1255 -	13,96,250		1,943	1845 -	27,830	567	2,209	30,606	
1256 -	13,42,396		1,577	1846 -	36,452	8,925	1,607	46,984	
1257 -	15,63,725		897	1847 -	40,843	11,764	6,859	59,466	
1258 -	12,06,365	12,92,399	- - -	1848 -	66,857	15,083	3,379	85,319	64,252
1259 -	12,05,265		- - -	1849 -	51,179	13,662	3,113	67,954	
1260 -	11,44,247		- - -	1850 -	52,013	7,765	1,760	61,538	

Note.—There are no accounts for Fusly 1231, as the district was under the Decennial Village Rent.

* Fusly 1241 is omitted in taking the average, because the failure of the north-east monsoon in that year was such as to reduce the irrigated cultivation and revenue in this and neighbouring districts to little more than half its usual amount.

During the Decennial Village Lease, which terminated in 1821, the Government outlay in repairs was small; but the renters in many instances spent a good deal on the tanks and channels.

Appendix (R.)

STATEMENT showing the whole Cost of the Lower *Colleroon* Anicut and the Works connected with it, in the Districts of *South Arcot* and *Tanjore*; as well as the Increase of Revenue obtained thereby.

Cost of the Works, including all Improvements and Repairs.				INCREASE OF REVENUE OBTAINED.								
				IN SOUTH ARCOT.						TANJORE.		
1. YEARS.	2. In South Arcot.	3. In Tanjore.	4. TOTAL.	5. Fuslies.	6. Extent of Wet Cultivation.	7. Revenue.	8. Kusser or additional Assessment on Dry Lands watered.	9. Total Revenue.	10. Price of White Paddy per Garce.	11. Fuslies.	12. Extent of Cultivation.	13. Revenue.
	Rs.	*Rs.*	*Rs.*		*Acres.*	*Rs.*	*Rs.*	*Rs.*	*Rs. a.*		*Acres.*	*Rs.*
1836 - -	1,29,050	- -	1,29,050	1233	18,201	1,38,016	- -	1,38,016	131 11	1241	23,525	1,10,904
1837 - -	11,229	10,819	22,048	1234	21,132	1,57,418	- -	1,57,418	159 1	1242	23,970	1,12,154
1838 - -	4,477	28,522	32,999	1235	22,737	1,70,084	- -	1,70,084	112 3	1243	24,620	1,14,354
1839 - -	15,299	6,149	21,448	1236	21,854	1,60,714	- -	1,60,714	91 11	1244	25,005	1,16,051
1840 - -	25,268	14,462	39,730	1237	16,796	1,18,763	- -	1,18,763	65 14	1245	25,645	1,17,325
1841 - -	52,050	3,357	55,407	1238	15,881	1,09,332	- -	1,09,332	82 3	1246	25,185	1,15,505
1842 - -	13,071	18,435	31,506	1239	18,936	1,19,273	63	1,19,336	77 3			
1843 - -	6,761	7,783	14,544	1240	12,985	87,338	66	87,404	78 11			
1844 - -	12,264	2,843	15,107	1241	10,277	62,944	78	63,022	72 15	Average of six years -	24,658	1,14,382
1845 - -	8,627	1,041	9,668	1242	14,974	99,396	174	99,570	94 6			
1846 - -	10,258	117	10,375	1243	17,241	1,18,984	71	1,19,055	128 4			
1847 - -	7,456	437	7,893									
1848 - -	21,855	1,086	22,941									
1849 - -	19,748	- -	19,748									
1850 - -	21,602	2,612	24,214									
TOTAL - -	3,59,015	97,663	4,56,678	Average of 11 years before the improvements -	17,365	1,22,023	90	1,22,065	99 7			
				1244	24,621	1,76,486	1,791	1,78,277	94 4			
				1245	25,862	1,87,265	1,501	1,88,766	70 4			
				1246	25,783	1,87,602	3,457	1,91,059	102 12			
Average yearly increase of Revenue:												
In South Arcot - - -	1,15,081											
In Tanjore - - - -	13,511											
TOTAL - - -	1,28,592			1247	30,397	2,26,033	4,285	2,30,318	98 10	1247	26,145	1,19,896
				1248	32,883	2,44,546	8,429	2,52,975	97 15	1248	26,035	1,19,987
				1249	33,732	2,52,575	13,758	2,66,333	83 1	1249	26,510	1,21,813
				1250	32,690	2,44,735	13,896	2,58,631	67 -	1250	27,050	1,24,006
				1251	25,149	1,89,812	13,003	2,02,815	53 2	1251	27,470	1,25,553
				1252	21,318	1,57,573	14,015	1,71,588	63 10	1252	26,960	1,24,589
				1253	24,577	1,82,233	19,195	2,01,428	70 1	1253	27,345	1,25,181
				1254	26,591	1,98,509	23,449	2,21,958	75 -	1254	28,035	1,27,008
				1255	28,779	2,17,815	27,475	2,45,290	91 2	1255	28,965	1,30,194
				1256	35,270	2,69,321	34,437	3,03,758	97 7	1256	29,720	1,32,769
				1257	33,769	2,58,514	34,682	2,93,196	74 11	1257	29,365	1,32,853
				1258	26,466	1,96,900	28,742	2,25,642	58 2	1258	29,740	1,34,900
				1259	22,292	1,61,325	22,163	1,83,488	65 3	1259	30,165	1,36,296
				1260	31,471	2,32,705	29,926	2,62,631	73 9	1260	30,080	1,35,460
				Average of 14 years after the improvements -	28,956	2,16,614	20,532	2,37,146	76 5	- -	28,113	1,27,893
				Average annual gain by the works	11,591	94,591	20,442	1,15,081	- -	- -	3,455	13,511

Note.—The amount of charges in Tanjore is exclusive of *Rs.* 1,247. 12., the average amount of the usual and ordinary repair of the old works benefited by the anicut; because that charge would have been necessary under any circumstances.

Appendix (S.)

STATEMENT showing the MARAMUT EXPENDITURE in the *Tanjore* District for the Thirty Years from 1821 to 1850, as well as the Revenue from IRRIGATED LAND in the same District for the Thirty Fuslies from 1231 to 1260.

YEARS.	MARAMUT EXPENDITURE. In each Year.	MARAMUT EXPENDITURE. Five Year Averages.	MARAMUT EXPENDITURE. Ten Year Averages.	Fuslies.	WET CULTIVATION. In each Year. Extent.	In each Year. Revenue.	Five Year Averages. Extent.	Five Year Averages. Revenue.	Ten Year Averages. Extent.	Ten Year Averages. Revenue.
	Rs.	*Rs.*	*Rs.*		*Acres.*	*Rs.*	*Acres.*	*Rs.*	*Acres.*	*Rs.*
1821	52,512			1231	5,31,081	25,12,988				
1822	54,206			1232	5,32,880	27,26,998				
1823	66,376	58,038		1233*	5,40,879	36,58,258	5,38,829	32,56,795		
1824	57,903			1234*	5,40,489	44,22,742				
1825	59,196		49,194	1235	5,49,170	29,62,992				
1826	32,983			1236	5,66,909	24,11,294			5,57,556	29,44,685
1827	25,268			1237	5,66,156	22,11,345				
1828	28,637	40,350		1238	5,74,942	30,62,105	5,76,214	26,32,575		
1829	32,881			1239	5,80,972	27,24,832				
1830	81,982			1240	5,92,093	27,53,300				
1831	98,640			1241	5,94,037	28,53,999				
1832	1,04,497			1242	6,08,517	31,20,057				
1833	98,279	94,843		1243	5,95,557	32,39,164	6,04,447	29,93,315		
1834	1,13,736			1244	6,14,460	29,62,462				
1835	59,063		96,824	1245	6,09,667	27,90,896				
1836	1,49,992			1246	5,82,269	29,91,361			6,12,312	30,11,973
1837	85,620			1247	6,22,162	30,12,321				
1838	88,617	98,806		1248	6,23,769	31,05,019	6,20,178	30,30,631		
1839	91,703			1249	6,33,276	31,13,621				
1840	78,096			1250	6,39,418	29,30,837				
1841	81,239			1251	6,51,709	27,10,589				
1842	97,100			1252	6,47,729	29,30,935				
1843	93,657	1,00,917		1253	6,47,775	30,77,911	6,49,682	30,78,878		
1844	97,868			1254	6,43,881	31,34,590				
1845	1,34,723		91,523	1255	6,57,316	35,40,366				
1846	93,305			1256	6,66,089	35,10,359			6,60,538	31,54,922
1847	63,655			1257	6,65,858	32,09,515				
1848	91,458	82,129		1258	6,74,261	30,59,991	6,71,394	32,30,967		
1849	62,027			1259	6,76,079	31,66,739				
1850	1,00,198			1260	6,74,684	32,08,233				

* Owing to the dearth in other districts in the Fuslies 1233 and 1234, the ordinary produce of grain in Tanjore, saved by the ample supply of water from the river, rose in price; and the revenue in those Fuslies exceeded the amounts obtained in any succeeding years, by reason of the revenue being at that time dependent on the selling prices of grain.

Appendix (T.)

STATEMENT showing the Total Number of ESTIMATES above and below *Rs.* 1,000, sanctioned in 1850, for Repairs and Improvements to WORKS of IRRIGATION.

DISTRICTS.	ORDINARY ESTIMATES. Above 1,000 Rupees. No.	Above 1,000 Rupees. Amount.	Below 1,000 Rupees. No.	Below 1,000 Rupees. Amount.	TOTAL. No.	TOTAL. Amount.	OCCASIONAL ESTIMATES. Above 1,000 Rupees. No.	Above 1,000 Rupees. Amount.	Below 1,000 Rupees. No.	Below 1,000 Rupees. Amount.	TOTAL. No.	TOTAL. Amount.	TOTAL of Ordinary and Occasional Estimates. No.	TOTAL of Ordinary and Occasional Estimates. Amount.
Bellary	7	11,853	146	18,838	153	30,691	–	–	15	2,782	15	2,782	168	33,473
Cuddapah	–	–	85	12,638	85	12,638	–	–	21	4,896	21	4,896	106	17,534
Coimbatore	5	7,247	142	23,950	147	31,197	–	–	4	1,927	4	1,927	151	33,124
Chingleput	5	8,964	205	30,931	210	39,895	3	7,210	31	7,329	34	14,539	244	54,434
Ganjam	–	–	202	11,347	202	11,347	–	–	3	1,120	3	1,120	205	12,467
Guntoor	3	–	232	–	235	–	–	–	75	13,382	75	13,382	310	13,382
Kurnool	1	1,558	58	5,502	59	7,060	3	4,524	12	1,780	15	6,304	74	13,364
Masulipatam	12	21,871	220	27,268	232	49,139	–	–	4	1,449	4	1,449	236	50,588
Madura	2	2,447	103	21,690	105	24,137	–	–	6	920	6	920	111	25,057
North Arcot	5	11,603	160	29,093	165	40,696	2	8,313	21	3,404	23	11,717	188	52,413
Nellore	–	–	198	17,229	198	17,229	–	–	16	2,684	16	2,684	214	19,913
Rajahmundry	13	27,224	270	50,974	283	78,198	–	–	–	–	–	–	283	78,198
Salem	–	–	159	10,327	159	10,327	–	–	28	4,353	28	4,353	187	14,680
South Arcot	4	5,108	207	18,624	211	23,732	2	7,906	13	2,280	15	10,186	226	33,918
Tanjore	4	7,346	828	59,406	832	66,752	2	11,533	–	–	2	11,533	834	78,285
Trichinopoly	7	11,926	379	45,521	386	57,447	–	–	22	4,257	22	4,257	408	61,704
Tinnevelly	7	10,298	307	49,025	314	59,323	2	2,195	32	6,947	34	9,142	348	68,465
Vizagapatam	–	–	44	4,767	44	4,767	1	2,125	1	477	2	2,602	46	7,369
TOTAL	75	1,27,445	3,945	4,37,130	4,020	5,64,575	15	43,806	304	59,987	319	1,03,793	4,339	6,68,368

Appendix (U.)

STATEMENT showing the COLLECTIONS from all Sources of REVENUE of the *Guntoor* District, from Fusly 1236 to 1260.

FUSLIES.	Land Revenue.	Salt.	Sayer and Frontier Duties.	Moturpha.	Abkarry.	Sundry Small Farms.	Sea Custom.	Stamps.	TOTAL.
	Rs.	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*
1236 - - -	14,67,918	2,46,269	96,641	67,059	14,894	14,131	4,409	16,755	19,28,076
1237 - - -	14,72,875	2,39,447	1,11,394	61,956	14,891	13,547	5,897	14,748	19,34,755
1238 - - -	14,11,637	2,62,057	1,05,636	61,990	15,366	14,432	6,603	15,202	18,92,923
1239 - - -	14,54,127	4,28,166	1,05,511	61,712	15,306	13,637	5,859	14,770	20,99,088
1240 - - -	13,08,719	3,14,706	96,861	62,466	15,216	12,954	2,887	13,090	18,26,899
1241 - - -	12,49,733	3,85,212	92,586	62,709	15,233	13,780	1,957	12,169	18,33,329
Average of the Six Years -	13,94,168	3,12,642	1,01,438	62,982	15,151	13,746	4,602	14,455	19,19,178
1242 - - -	6,58,500	1,59,886	64,555	40,891	12,340	9,557	3,142	8,019	9,56,890
1243 - - -	6,71,654	2,98,138	45,707	23,222	4,809	4,484	2,001	6,367	10,56,382
1244 - - -	5,11,593	2,29,243	48,756	25,841	10,029	7,606	3,328	6,438	8,42,834
1245 - - -	8,84,413	2,49,229	59,848	32,310	11,130	8,771	4,050	7,340	12,57,091
1246 - - -	7,82,622	2,38,244	60,699	32,088	11,634	9,614	2,233	7,753	11,44,887
1247 - - -	7,85,197	2,92,487	59,283	51,085	12,193	9,638	3,015	8,283	12,21,181
Average of the Six Years -	7,15,663	2,44,537	56,474	34,239	10,355	8,278	2,961	7,366	10,79,877
1248 - - -	8,48,968	3,38,781	59,142	51,863	12,600	11,562	2,468	7,815	13,33,199
1249 - - -	9,36,647	3,53,955	62,381	37,724	12,764	9,597	2,778	8,421	14,24,267
1250 - - -	9,99,138	2,91,940	64,385	42,102	12,869	9,977	2,457	14,398	14,37,266
1251 - - -	9,05,180	3,03,621	56,331	41,317	13,720	9,878	2,978	7,024	13,40,049
1252 - - -	8,44,881	2,76,886	57,406	36,252	14,569	9,398	3,591	6,675	12,49,658
1253 - - -	6,87,832	3,46,178	43,422	37,822	14,922	7,297	4,940	7,031	11,49,444
Average of the Six Years -	8,70,440	3,18,560	57,177	41,180	13,574	9,618	3,202	8,560	13,22,313
1254 - - -	8,42,572	3,55,330	10,986	34,149	15,566	11,435	7,275	5,296	12,82,609
1255 - - -	12,84,203	3,45,133	5,958	42,212	18,073	7,780	7,622	3,236	17,14,217
1256 - - -	14,28,818	3,10,754	4,769	46,400	17,016	11,718	4,194	4,652	18,28,321
1257 - - -	14,65,290	3,87,023	3,923	47,439	19,373	9,533	4,021	3,414	19,40,016
1258 - - -	14,89,754	4,06,736	3,005	48,392	22,538	11,344	7,420	8,740	19,97,929
1259 - - -	14,11,117	3,84,655	3,439	48,492	22,538	11,168	755	7,860	18,90,024
1260 - - -	13,01,038	4,12,919	3,746	45,969	22,250	11,133	1,924	8,479	18,07,458
Average of the Seven Years -	13,17,541	3,71,792	5,118	44,721	19,622	10,587	4,744	5,953	17,80,082
Average of the Nineteen Years	9,86,285	3,14,796	37,775	40,293	14,785	9,552	3,694	7,223	14,14,406

Note.—In Fusly 1243 a further sum of 3,02,798 was realized by the sale of Government bonds belonging to the Vausareddy estate; and so also, in the Fuslies 1256 to 1260, various sums, amounting on the whole to 2,10,008 rupees, were similarly realized and credited to the old balances long outstanding against the estate. These sums are omitted from this statement, which is intended as a comparison of the resources of the district in the several years contained in it.

Appendix (V.)

STATEMENT showing the EXPENDITURE of IRRIGATION in

1. YEARS.	2. Ganjam.	3. Vizagapatam.	4. Rajahmundry.	5. Masulipatam.	6. Guntoor.	7. Nellore.	8. Chingleput.	9. Madras.	10. Northern Division of Arcot.	11. Southern Division of Arcot.	12. Kurnool.	13. Bellary.
	Rs.	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*
1816–17	1,462	520	- -	- -	385	33,859	24,192	3,234	46,556	846	- -	28,026
1817–18	1,794	525	2,723	- -	12,766	11,850	45,218	1,942	24,236	63,645	- -	45,925
1818–19	1,655	525	13,220	- -	3,549	22,254	86,163	1,209	29,056	25,015	- -	68,390
1819–20	- -	525	7,109	- -	3,675	17,174	74,393	1,301	22,450	1,01,650	- -	33,952
1820–21	3,467	- -	8,530	- -	1,338	23,865	75,990	154	16,415	57,594	- -	1,68,950
Average	2,095	524	7,896	- -	4,343	21,800	61,191	1,568	27,743	49,750	- -	69,049
1821–22	4,664	525	7,684	1,433	940	32,256	1,75,639	3,180	18,889	63,107	- -	18,021
1822–23	4,609	- -	9,555	- -	4,538	37,183	1,44,686	337	87,352	44,763	- -	1,50,109
1823–24	6,499	1,085	17,908	- -	- -	1,04,089	1,70,932	1,840	71,964	79,492	- -	1,38,282
1824–25	7,454	1,665	13,827	2,433	5,122	41,972	90,728	654	42,275	50,878	- -	41,651
1825–26	6,171	100	10,711	4,520	2,625	59,560	32,844	20,386	22,953	47,721	- -	1,62,693
Average	5,879	843	11,937	2,795	3,306	55,012	1,22,966	5,279	48,687	57,192	- -	1,00,151
1826–27	6,243	835	3,890	123	8,078	61,353	1,31,339	211	1,27,937	1,12,988	- -	1,91,941
1827–28	5,809	3,234	7,216	300	5,936	33,203	1,29,295	5,115	1,59,647	1,72,976	- -	2,49,421
1828–29	4,881	- -	3,841	150	5,594	30,334	78,544	2,001	76,277	96,796	- -	1,66,456
1829–30	4,733	- -	6,236	200	4,126	27,066	71,423	6,710	68,781	56,055	- -	1,42,801
1830–31	8,542	398	5,532	- -	2,730	35,992	92,609	3,735	46,542	59,164	- -	1,41,081
Average	6,042	1,489	5,342	193	5,293	37,590	1,00,642	3,554	95,837	99,596	- -	1,78,340
1831–32	- -	- -	2,358	132	1,300	35,977	72,997	371	45,545	97,697	- -	90,412
1832–33	3,710	9,810	7,099	260	800	33,725	31,916	731	46,918	92,189	- -	92,633
1833–34	3,518	- -	14,675	10	1,600	72,955	69,156	68	37,900	28,204	- -	70,108
1834–35	4,440	- -	4,566	55	1,406	37,358	41,975	23	22,642	91,167	- -	74,317
1835–36	1,350	3,310	5,121	173	1,524	23,805	63,054	1,074	31,796	1,79,749	- -	58,526
Average	3,255	6,560	6,764	126	1,326	40,764	55,820	453	36,960	97,801	- -	77,199
1836–37	11,978	2,266	8,079	400	1,836	26,641	67,463	940	45,212	1,43,896	- -	57,359
1837–38	17,492	3,879	7,034	900	- -	24,077	62,189	2,263	92,009	59,776	- -	57,015
1838–39	16,553	584	12,640	227	2,510	39,701	54,534	707	72,748	46,847	- -	66,866
1839–40	9,355	1,340	10,835	703	- -	39,404	61,245	498	59,642	42,112	- -	50,835
1840–41	7,524	10,980	36,831	787	3,904	42,514	51,998	1,109	64,835	1,07,935	- -	64,947
Average	12,580	3,810	15,080	603	2,750	34,467	59,486	1,103	66,889	80,113	- -	59,404
1841–42	9,567	8,016	22,000	1,364	2,500	44,263	73,000	1,100	64,835	90,848	- -	65,000
1842–43	7,947	2,600	18,000	1,866	2,000	80,783	55,000	700	45,520	75,636	15,000	51,150
1843–44	5,813	4,104	30,172	12,751	2,490	15,559	24,701	189	32,067	35,336	1,789	60,776
1844–45	5,592	9,168	31,006	4,944	2,060	36,459	30,598	381	19,273	43,227	5,119	43,500
1845–46	3,739	5,524	53,859	2,481	1,643	27,734	17,894	85	23,114	90,456	5,588	51,671
Average	6,532	5,882	31,007	4,681	2,139	40,690	40,239	451	36,962	67,101	6,874	54,419
1846–47	817	698	1,48,076	7,993	30,774	36,652	51,804	4,682	50,882	1,10,397	6,318	75,770
1847–48	3,984	4,379	4,45,963	11,872	45,722	56,383	1,40,758	2,594	87,928	79,931	6,496	46,859
1848–49	4,458	11,099	1,84,948	17,926	40,161	54,333	92,916	5,755	79,926	68,561	4,858	43,275
1849–50	2,454	11,148	2,79,066	37,802	43,847	35,318	52,370	2,055	54,818	42,545	9,448	44,191
1850–51	16,388	6,206	2,83,093	39,318	49,757	21,053	49,765	1,341	52,655	52,334	9,747	53,382
Average	5,620	6,706	2,68,229	22,982	42,052	40,748	77,523	3,285	65,242	70,754	7,373	52,695
General Average for the 35 Years	6,202	3,752	50,688	5,597	9,289	38,763	73,981	2,247	54,046	74,643	7,151	84,751

Appendix (V.)

the *Madras* Presidency from 1816–17 to 1850–51.

14. Cuddapah.	15. Salem.	16. Coimbatore.	17. Tanjore.	18. Trichinopoly.	19. Madura.	20. Tinnevelly.	21. Malabar.	22. Canara.	23. Seringapatam.	24. Total.	25. YEARS.
Rs.	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	
43,939	- -	64,400	1,24,984	16,765	23,462	2,163	- -	- -	697	4,19,921	1816-17.
53,762	22,116	19,849	74,592	15,912	1,05,842	1,179	- -	- -	860	5,09,243	1817-18.
47,227	105	65,771	1,24,450	60,084	20,002	5,647	- -	- -	680	5,80,235	1818-19.
44,655	8,661	44,231	1,60,513	91,936	71,797	6,528	- -	- -	638	6,91,188	1819-20.
47,679	40,213	33,689	65,199	72,063	85,632	2,949	2,475	629	635	7,07,467	1820-21.
47,452	17,774	45,588	1,09,948	51,352	61,347	3,693	2,475	629	702	5,81,610	Average.
35,990	68,822	58,252	69,586	53,767	52,174	2,779	5,564	- -	495	6,73,767	1821-22.
30,148	38,211	49,481	68,382	41,173	29,158	3,417	2,773	- -	58	7,45,933	1822-23.
16,821	1,30,196	51,736	81,918	33,232	36,068	3,482	3,705	- -	- -	9,49,249	1823-24.
47,266	48,978	34,097	65,943	31,075	33,521	11,215	4,010	800	- -	5,75,564	1824-25.
27,543	96,061	35,193	68,856	36,002	56,063	44,727	3,536	- -	- -	7,38,265	1825-26.
31,554	76,454	45,752	70,937	39,050	41,397	13,124	3,918	800	277	7,36,556	Average.
37,642	64,587	30,312	55,540	20,188	1,14,245	78,579	3,776	- -	- -	10,49,807	1826-27.
65,002	76,435	30,727	79,575	1,59,101	60,073	77,982	3,200	- -	- -	13,24,247	1827-28.
40,405	38,724	35,834	64,756	47,137	64,423	72,052	- -	- -	- -	8,28,205	1828-29.
39,701	24,007	16,640	83,589	63,653	67,158	45,695	- -	- -	- -	7,28,574	1829-30.
19,957	25,150	13,752	1,09,301	39,142	73,362	- -	45,987	- -	- -	7,22,975	1830-31.
40,141	45,780	25,453	78,552	65,844	75,852	68,577	17,654	- -	- -	9,30,762	Average.
11,687	27,550	24,699	1,26,204	25,822	88,256	74,291	- -	- -	- -	7,25,398	1831-32.
15,710	40,406	22,476	1,15,933	31,980	85,869	58,514	- -	- -	- -	6,90,679	1832-33.
21,916	27,648	19,883	1,10,122	40,956	46,480	45,022	- -	- -	- -	6,10,221	1833-34.
30,910	27,434	21,329	1,03,427	43,229	19,884	44,818	- -	- -	- -	5,68,980	1834-35.
22,484	34,211	16,504	1,47,642	36,797	18,812	39,761	- -	- -	- -	6,85,691	1835-36.
20,541	31,450	20,978	1,20,666	35,757	51,860	52,501	- -	- -	- -	6,56,194	Average.
15,560	23,429	20,031	1,10,494	54,182	35,707	61,497	- -	- -	- -	6,86,970	1836-37.
18,948	20,977	45,289	80,811	40,383	26,782	66,113	- -	- -	- -	6,35,937	1837-38.
27,279	14,993	28,111	1,42,289	27,865	31,859	76,289	- -	110	- -	6,62,712	1838-39.
45,540	15,607	23,028	1,31,488	45,008	39,268	76,889	- -	80	- -	6,52,877	1839-40.
25,525	16,072	16,580	93,298	48,434	40,766	77,144	- -	-	- -	7,11,165	1840-41.
26,590	18,216	26,608	1,11,676	45,174	34,876	71,586	- -	95	- -	6,69,932	Average.
22,480	16,000	29,406	1,04,530	40,000	30,000	65,411	- -	- -	- -	6,90,320	1841-42.
28,176	18,700	21,500	88,000	50,544	20,000	51,988	- -	- -	- -	6,35,110	1842 43.
23,764	10,604	20,689	1,12,934	53,172	13,606	49,813	- -	230	- -	5,10,559	1843-44.
30,834	19,046	21,516	1,40,578	60,746	26,580	46,442	- -	- -	- -	5,77,068	1844-45.
26,016	13,592	18,620	1,14,606	64,473	41,578	50,686	- -	117	- -	6,13,476	1845-46.
26,254	15,588	22,346	1,12,130	53,787	26,353	52,868	- -	174	- -	6,05,307	Average.
20,818	23,563	27,356	84,581	63,992	28,709	68,176	- -	- -	- -	8,42,059	1846-47.
32,447	21,410	18,506	93,109	84,554	29,021	84,646	2	- -	- -	12,96,565	1847-48.
21,226	20,021	22,431	1,21,119	78,932	34,285	91,021	- -	- -	- -	9,97,251	1848-49.
17,139	18,591	30,359	1,15,808	59,821	37,677	75,735	- -	- -	- -	9,70,192	1849-50.
24,595	17,453	25,384	1,73,395	83,381	34,194	87,456	- -	- -	- -	10,80,897	1850-51.
23,245	20,208	24,801	1,17,602	74,136	32,777	81,407	2	- -	- -	10,37,393	Average.
30,883	32,635	30,219	1,03,073	52,157	46,352	48,536	7,503	328	580	7,45,393	General Average for the 35 Years.

Appendix (W.)

STATEMENT of Charges incurred in the Repair and Construction of ROADS, BRIDGES, and GHAUTS

1. YEARS.	DISTRICTS. 2. Bellary.	3. Chingleput.	4. Canara.	5. Coimbatore.	6. Cuddapah.	7. Ganjam.	8. Guntoor.	9. Madura.	10. Malabar.	11. Masulipatam.	12. Nellore.	13. North Arcot.	14. Rajahmundry.	15. Salem.
	Rs.	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*
1826	- -	16,214	1,851	230	387	3,707	18,828	- -	1,610	1,622	44,520	- -	3,663	2,000
1827	239	10,564	1,777	535	- -	32,008	11,820	58	48,322	- -	33,173	- -	109	10,093
1828	2,366	8,268	1,737	90	- -	21,569	'917	2,944	5,211	18,271	16,360	- -	- -	550
1829	172	2,332	1,207	443	- -	4,457	1,339	2,910	9,172	39	3,244	- -	- -	557
1830	796	3,478	39,602	1,567	2,350	2,456	1,164	- -	3,150	13	926	- -	287	6,494
Average	893	8,171	9,235	573	1,369	12,839	6,814	1,971	13,493	4,986	19,645	- -	1,353	3,939
1831	520	1,373	1,923	458	1,667	1,572	3,558	127	1,150	- -	8,663	- -	- -	8,641
1832	276	351	1,159	2,817	19	265	2,736	2,595	8,670	- -	4,380	3,179	- -	6,310
1833	3,854	1,044	9,367	8,944	1,154	20	38,298	1,624	15,594	677	21,648	- -	- -	7,686
1834	21	860	2,775	566	1,038	5	45,982	3,001	12,381	- -	17,728	9,030	- -	6,575
1835	316	95	1,726	280	93	- -	567	1,287	1,509	- -	3,647	- -	- -	10,281
Average	997	745	3,390	2,613	794	466	18,228	1,727	7,861	677	11,213	6,105	- -	7,899
1836	608	544	2,800	626	18	1,212	1,585	4,305	14,057	217	6,481	- -	- -	9,316
1837	981	1,157	3,880	16,133	50	4,800	1,872	13,395	19,361	464	1,894	- -	38	7,166
1838	1,101	1,13,790	3,740	10,003	1,050	295	373	12,675	34,713	2,110	23,940	235	60	9,189
1839	5,544	49,967	2,451	16,474	508	1,396	483	8,505	39,285	- -	4,553	605	18	13,512
1840	903	1,40,287	24,336	24,737	506	17,527	1,126	15,223	13,649	1,439	33,650	19,046	1,369	2,433
Average	1,827	61,149	7,441	13,595	426	5,046	1,088	10,820	24,213	1,058	14,104	6,629	371	8,323
1841	860	15,186	1,604	1,270	2,223	20,151	1,736	17,880	24,473	392	1,262	59,287	1,044	2,587
1842	1,729	6,166	1,88,185	1,930	2,103	7,177	21,729	16,044	24,316	296	3,727	58,602	350	4,581
1843	424	4,177	2,541	7,658	791	5,730	1,043	3,270	19,923	324	4,959	12,336	210	5,085
1844	2,006	2,237	4,234	1,477	317	1,512	1,426	7,371	9,739	459	3,296	16,767	301	3,879
1845	10,128	1,597	3,126	11,638	327	2,627	2,622	5,483	23,705	5,419	1,513	3,535	895	75
Average	3,029	5,873	39,938	4,795	1,152	7,439	5,711	10,010	20,431	1,378	2,951	30,105	560	3,241
1846	879	2,561	5,219	7,275	2,227	7,932	803	14,142	15,774	664	1,356	1,367	3,206	5,513
1847	6,730	2,344	31,635	1,550	550	2,894	725	13,270	10,256	453	88	317	7,120	33,957
1848	1,141	6,844	1,05,446	27,547	802	739	8,076	9,081	31,260	5,312	408	1,458	1,937	1,955
1849	4,778	431	61,777	13,892	8,109	4,708	1,614	11,052	56,151	4,199	495	492	3,083	2,494
1850	5,936	713	49,372	9,298	1,144	6,239	3,812	3,346	13,589	1,865	2,358	4,537	286	15,705
Average	3,893	2,579	50,690	11,912	2,566	4,502	3,006	10,178	25,406	2,499	941	1,634	3,126	11,925
General Average for the 25 years	2,180	15,703	22,139	6,698	1,247	6,292	6,969	7,373	1,825	2,328	9,778	12,720	1,410	70,665

Appendix (W.)

in the Territories under the Presidency of *Fort St. George*, from 1826 to 1850.

DISTRICTS.								24.	25.	26.	27.	28.	29.
16. South Arcot.	17. Tanjore.	18. Tinnevelly.	19. Trichinopoly.	20. Vizagapatam.	21. Madras.	22. Kurnool.	23. TOTAL.	High Western and other Trunk Roads.	Cost of Convict Labour employed on the Trunk Roads.	Red Hill Railroad.	Grand Total.	Grand Total, exclusive of the Cost of Convict Labour employed on the Trunk Road in Column 25.	YEARS.
Rs.	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	
1,668	17,752	2,908	- -	8,893	- -	- -	1,25,853	- -	- -	- -	1,25,853	1,25,853	1826
8,446	7,527	5,720	693	1,330	- -	- -	1,72,414	- -	- -	- -	1,72,414	1,72,414	1827
1,137	3,675	1,490	432	- -	- -	- -	85,017	- -	- -	- -	85,017	85,017	1828
249	4,381	848	1,170	3,225	- -	- -	35,745	- -	- -	- -	35,745	35,745	1829
- -	9,775	700	- -	106	- -	- -	72,864	- -	- -	- -	72,864	72,864	1830
2,875	8,622	2,333	765	3,389	- -	- -	98,379	- -	- -	- -	98,379	98,379	Average.
2,778	9,559	1,774	- -	495	- -	- -	44,258	- -	- -	- -	44,258	44,258	1831
3,113	1,202	332	- -	- -	- -	- -	37,404	- -	- -	- -	37,404	37,404	1832
5,151	7,893	- -	6,080	4,769	- -	- -	1,33,803	- -	- -	- -	1,33,803	1,33,803	1833
3,455	342	763	890	504	- -	- -	1,05,916	- -	- -	- -	1,05,916	1,05,916	1834
5,117	3,761	437	- -	2,645	- -	- -	31,761	- -	- -	- -	31,761	31,761	1835
3,923	4,551	827	3,485	213	- -	- -	70,628	- -	- -	- -	70,628	70,628	Average.
1,694	4,136	297	274	- -	- -	- -	48,170	- -	- -	- -	48,170	48,170	1836
2,609	22,267	3,047	9,699	- -	- -	- -	1,08,812	- -	- -	8,704	1,17,516	1,17,516	1837
1,759	11,331	1,033	3,003	24	- -	- -	2,30,424	- -	85,855	84,387	4,00,666	3,14,811	1838
168	26,937	5,534	455	533	- -	- -	1,76,928	- -	1,18,387	6,244	3,01,559	1,83,172	1839
3,352	1,010	15,629	1,587	- -	- -	- -	3,17,809	- -	98,559	3,044	4,19,412	3,20,853	1840
1,916	13,136	5,108	3,004	279	- -	- -	1,76,429	- -	1,00,934	25,595	2,57,465	1,96,904	Average.
3,098	2,236	6,741	4,717	- -	- -	- -	1,66,747	4,217	93,659	5,232	2,69,855	1,76,196	1841
65	8,196	4,292	2,628	- -	- -	- -	3,52,116	5,294	98,755	368	4,56,533	3,57,778	1842
7,089	3,094	12,269	3,055	1,395	- -	- -	77,239	4,927	61,130	- -	1,43,296	82,166	1843
12,502	1,432	5,599	9,415	5,535	- -	- -	81,923	3,726	60,386	- -	1,46,035	85,649	1844
							1,07,173	- -	9,497	- -	1,16,670	1,07,173	1845
4,563	3,410	6,840	4,174	2,397	- -	- -	1,57,040	4,541	64,685	2,800	2,26,478	1,61,792	Average.
2,883	13,543	11,085	5,336	280	6,080	- -	1,08,125	67,874	10,378	- -	1,86,377	1,75,999	1846
9,734	8,549	4,998	6,526	300	781	- -	1,42,777	1,54,710	9,444	- -	3,06,931	2,97,487	1847
10,850	18,185	7,132	19,497	265	- -	- -	2,57,935	1,93,556	7,685	- -	4,59,176	4,51,491	1848
20,535	12,280	12,600	36,054	300	892	2,958	2,58,894	3,23,080	- -	- -	5,81,974	5,81,974	1849
11,877	500	8,362	9,093	2,572	- -	- -	1,50,604	4,46,256	- -	- -	5,96,860	5,96,806	1850
11,176	10,611	8,835	15,301	743	2,584	2,958	1,83,667	2,37,095	9,169	- -	4,26,264	4,20,762	Average.
4,975	8,066	4,954	6,083	1,857	2,584	2,958	1,77,228	1,33,737	59,430	17,996	2,15,843	1,89,693	General Average for the 25 years.

Note.—The entries in Column 24, for the years 1846 to 1850, include the cost of Establishment and Superintendence.

Appendix (X.) - - - - - -

STATEMENT of EXPENDITURE on BUILDINGS and REPAIRS under the

1.	MILITARY													
YEARS.	Presidency Division.		Mysore Division.		Southern Division.		Centre Division.		Northern Division.		Ceded Districts.		Malabar and Canara.	
	2. New Buildings.	3. Repairs.	4. New Buildings.	5. Repairs.	6. New Buildings.	7. Repairs.	8. New Buildings.	9. Repairs.	10. New Buildings.	11. Repairs.	12. New Buildings.	13. Repairs.	14. New Buildings.	15. Repairs.
	Rs.	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*
1831 -	30,726	44,790	5,448	19,909	86,887	27,846	7,804	11,445	1,791	9,515	31,248	3,044	59,628	8,694
1832 -	12,100	51,963	3,928	7,706	14,868	6,600	6,894	6,530	392	6,832	1,653	12,800	1,676	1,547
1833 -	69,162	88,775	1,040	9,980	4,661	26,032	2,248	16,328	298	6,460	971	9,380	16,354	5,799
1834 -	9,534	18,180	5,250	4,472	7,300	7,511	4,400	3,460	1,527	16,784	1,288	3,141	- -	5,728
1835 -	38,847	59,241	2,259	5,645	429	5,923	214	694	1,488	1,708	1,951	3,986	1,239	2,884
Average	32,074	52,590	3,585	9,543	22,829	14,782	4,312	7,691	1,099	8,260	7,422	6,470	15,779	4,930
1836 -	68,953	66,911	2,228	2,942	2,420	7,004	786	2,333	1,787	2,435	4,563	1,638	11,914	1,183
1837 -	95,649	55,101	3,825	3,142	7,978	15,998	5,173	5,125	7,211	2,132	3,201	7,205	3,483	954
1838 -	21,284	95,776	3,805	5,500	8,295	4,135	10,009	6,426	2,626	6,026	3,134	3,552	6,846	2,928
1839 -	1,15,579	1,02,325	12,987	5,651	9,141	4,715	6,306	3,701	27,261	3,500	5,951	5,536	3,382	527
1840 -	86,507	1,01,657	12,558	17,281	11,736	8,192	1,078	3,983	5,358	4,346	3,015	3,244	2,604	5,309
Average	77,594	84,354	7,081	6,903	7,914	8,009	4,671	4,314	8,848	3,688	3,973	4,235	5,646	2,180
1841 -	75,269	97,134	9,469	12,838	2,324	3,673	2,765	4,878	4,572	3,132	3,178	2,874	17,582	6,930
1842 -	1,51,996	70,484	21,853	6,517	11,791	6,340	100	1,236	238	2,105	9,838	6,423	3,734	6,245
1843 -	30,212	65,057	11,292	8,547	2,457	3,280	79	1,645	7,350	2,125	17,956	6,346	21,456	3,770
1844 -	39,988	36,714	8,701	2,467	17,954	7,020	4,432	5,786	1,357	888	1,778	3,087	1,331	1,942
1845 -	1,09,135	54,427	2,145	4,486	23,922	6,007	4,454	1,599	2,190	2,603	7,048	1,102	5,361	5,057
Average	81,320	64,763	10,692	6,971	11,690	5,264	2,366	3,029	3,141	2,171	7,960	3,966	9,893	4,789
1846 -	57,508	36,705	8,996	13,522	4,094	3,431	2,466	3,272	1,364	4,758	1,06,639	4,243	17,987	1,680
1847 -	32,549	45,326	17,011	20,933	15,427	9,118	13,258	12,554	14,720	7,885	5,107	7,391	47,106	2,288
1848 -	1,20,558	84,549	5,713	5,951	9,595	6,768	1,336	3,260	19,830	3,258	5,875	5,726	22,280	14,772
1849 -	1,32,176	85,076	15,213	8,982	5,179	2,672	1,700	2,311	3,056	1,647	3,566	1,729	4,039	2,373
1850 -	10,707	38,182	30,949	8,097	9,458	9,600	654	1,197	1,582	2,157	4,052	4,092	15,783	5,136
Average	70,700	57,968	15,576	11,497	8,751	6,318	3,883	4,519	8,111	3,941	25,048	4,636	21,439	5,250
General Average for the 20 years	65,422	64,919	9,234	8,728	12,796	8,593	3,808	4,888	5,300	4,515	11,101	4,827	13,189	4,287

Appendix (X.)

Presidency of *Fort Saint George*, from 1831 to 1850.

DEPARTMENT.							General Department.						29.
Nagapore Subsidiary Force.		Hyderabad Subsidiary Force including Jaulnah.		TOTAL.			23.	24.	25.	Grand Total.			
16. New Buildings.	17. Repairs.	18. New Buildings.	19. Repairs.	20. New Buildings.	21. Repairs.	22. Total.	New Buildings.	Repairs.	Total.	26. New Buildings.	27. Repairs.	28. Total.	YEARS.
Rs.	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	
35,269	10,183	1,961	5,485	2,60,762	1,40,911	4,01,673	1,07,650	50,324	1,57,974	3,68,412	91,235	5,59,647	1831.
17,062	7,024	13,528	2,414	72,101	1,03,416	1,75,517	97,069	17,257	1,14,326	1,69,170	20,673	2,89,843	1832.
44,716	4,852	3,060	3,530	1,42,510	1,71,136	3,13,646	1,38,056	45,304	1,83,360	2,80,566	16,440	4,97,006	1833.
15,852	5,303	7,682	11,500	52,833	76,079	1,28,912	77,134	52,975	1,30,109	1,29,967	29,054	2,59,021	1834.
12,360	9,625	3,160	2,807	61,947	92,513	1,54,460	10,341	21,438	31,779	72,288	13,951	1,86,239	1835.
25,051	7,397	5,878	5,147	1,18,029	1,16,810	2,34,839	86,050	37,460	1,23,510	2,04,079	1,54,270	3,58,349	Average.
13,303	292	7,425	1,304	1,13,379	86,042	1,99,421	22,452	39,469	61,921	1,35,831	1,25,511	2,61,342	1836.
18,936	2,079	18,859	9,041	1,64,315	1,00,777	2,65,092	65,099	46,694	1,11,793	2,29,414	1,47,471	3,76,885	1837.
47,417	8,111	9,588	1,646	1,13,004	1,34,100	2,47,104	1,12,162	45,162	1,57,324	2,25,166	1,79,262	4,04,428	1838.
41,846	9,211	899	256	2,23,352	1,35,422	3,58,774	57,467	82,396	1,39,863	2,80,819	2,17,818	4,98,637	1839.
21,024	7,425	14,451	2,817	1,58,331	1,54,254	3,12,585	1,03,398	64,947	1,68,345	2,61,729	2,19,201	4,80,930	1840.
28,505	5,424	10,244	3,012	1,54,476	1,22,119	2,76,595	72,116	55,734	1,27,850	2,26,592	1,77,853	4,04,445	Average.
5,302	1,859	10,413	1,092	1,30,874	1,34,410	2,65,284	84,619	37,551	1,22,170	2,15,493	1,71,961	3,87,454	1841.
42,065	9,108	1,73,975	909	4,15,590	1,09,367	5,24,957	55,705	32,916	88,621	4,71,295	1,42,283	6,13,578	1842.
10,088	4,273	56,390	3,201	1,57,280	98,244	2,55,524	96,067	58,620	1,54,687	2,53,347	1,56,864	4,10,211	1843.
8,872	4,002	1,395	1,556	85,808	63,462	1,49,270	24,513	12,795	37,308	1,10,321	76,257	1,86,578	1844.
17,395	6,312	3,542	2,617	1,75,192	84,210	2,59,402	39,138	61,664	1,00,802	2,14,330	1,45,874	3,60,204	1845.
16,744	5,111	49,143	1,875	1,92,949	97,939	2,90,888	60,008	40,709	1,00,717	2,52,957	1,38,648	3,91,605	Average
18,750	4,268	9,582	3,596	2,27,386	75,475	3,02,861	1,29,318	47,820	1,77,138	3,56,704	1,23,295	4,79,999	1846.
4,725	4,692	27,727	1,334	1,77,630	1,11,521	2,89,151	55,034	41,388	96,422	2,32,664	1,52,909	3,85,573	1847.
8,446	5,986	24,937	6,776	2,18,570	1,37,046	3,55,616	83,781	64,094	1,47,875	3,02,351	2,01,140	5,03,491	1848.
8,125	3,754	25,383	3,264	1,98,437	1,11,808	3,10,245	1,11,492	73,217	1,84,709	3,09,929	1,85,025	4,94,954	1849.
14,608	3,247	913	2,076	88,706	73,784	1,62,490	53,213	67,729	1,20,942	1,41,919	1,41,513	2,83,432	1850.
10,931	4,389	17,708	3,408	1,82,147	1,01,926	2,84,073	86,568	58,850	1,45,418	2,68,715	1,60,776	4,29,491	Average.
20,308	5,580	20,744	3,361	1,61,902	1,09,698	2,71,600	76,186	48,188	1,24,374	2,38,088	1,57,886	3,95,974	General Average for the 20 years.

Appendix (Y.)

STATEMENT showing the various Items of EXPENDITURE in the DEPARTMENT of PUBLIC WORKS, with their Amount for Eleven Years.

	1840–41.	1841–42.	1842–43.	1843–44.	1844–45.	1845–46.	1846–47.	1847–48.	1848–49.	1849–50.	1850–51.
	Rs.	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*
Repairs of tanks, channels, rivers, &c.	7,11,219	6,11,242	5,43,340	5,10,916	5,77,068	6,16,048	8,48,294	13,01,423	9,97,716	9,71,999	10,84,092
Repairs of buildings in the Revenue, Judicial, Military, &c., Departments	2,09,599	1,62,155	3,38,234	1,62,951	1,16,621	1,59,650	32,617	2,43,565	2,17,666	1,46,431	2,02,253
Erection of buildings in the Revenue, Judicial, Military, &c., Departments	1,40,513	43,912	1,53,131	90,965	79,531	2,17,415	1,64,511	2,28,192	1,78,117	1,19,751	93,319
Repairs and construction of public bungalows, choultries, hospitals, &c., including superintendence	26,516	24,944	24,416	26,608	27,358	32,402	28,772	26,109	29,746	28,715	28,804
Repairs of roads, bridges, ghauts, and passes	1,66,417	89,706	1,30,358	1,26,521	25,416	1,86,282	3,11,040	1,43,738	3,54,061	5,44,675	4,93,901
Construction of roads, bridges, ghauts and passes	52,062	71,538	1,68,025	44,101	10,209	49,770	1,95,867	2,17,827	1,65,254	70,406	97,691
Railroad, including establishment	15,756	4,317	369	3,925	- -	- -	- -	- -	- -	- -	5,747
Construction, purchase, repair and hire of ferry-boats	4,002	3,771	5,639	6,605	7,112	5,983	4,110	8,449	10,705	6,422	3,199
Wages of boat people, &c. employed in rivers	381	355	3,870	234	216	379	644	1,058	256	660	—
Repairs of forts and fortifications	1,755	828	1,497	905	2,229	3,155	- -	- -	- -	1,670	900
Expenses on account of burial-grounds, tombs, and Sir Thomas Munro's Statue	1,718	398	283	378	491	409	378	378	378	436	441
Expenses on account of Paumben Channel	19,663	6,404	11,877	9,581	64,509	13,893	12,787	17,355	9,888	8,851	8,291
Repairs of the Office furniture of the Government	420	- -	- -	420	420	750	420	433	478	405	647
Allowance and medical allowance for the convicts at Guindy, and for Europeans and Natives at the Godavery	2,444	- -	- -	599	431	502	- -	- -	1,679	2,978	2,792
Assessment on the Honourable Company's Buildings	9,408	7,384	7,399	7,663	14,276	7,022	7,114	- -	14,389	- -	7,219
Pay and establishment of Civil Engineer, Chief Engineer, Civil Architect, and Barrack-master, debited to the several Departments	1,65,596	1,58,414	1,69,435	1,42,606	1,78,341	1,83,927	1,94,874	2,31,584	2,47,356	2,48,157	2,53,637
Establishment of Civil Surveys	2,868	3,288	2,868	2,868	3,994	12,806	2,913	3,077	2,868	2,868	2,868
Expenses on account of Marine Surveys	13,935	22,880	- -	13,278	15,401	20,813	7,362	700	—	—	—
Bricklayer Maistries to superintend the Public Works at different stations	2,239	2,484	2,195	3,341	3,158	3,138	3,629	3,548	2,356	2,827	2,760
Public and Magnetic Observatory, &c.	15,820	12,391	44,689	39,041	35,661	30,573	31,285	29,478	23,287	18,319	21,749
Survey Department	75,319	459	68,647	59,465	46,603	41,387	36,273	32,279	33,102	- -	30,743
Trigonometrical Survey of India at Hyderabad	37,520	—	—	—	—	—	—	—	—	—	—
House-rent allowance to different persons, and rent of Public Offices	- -	38,675	37,437	- -	40,136	- -	- -	- -	40,423	- -	37,133
Expenses on account of forests and jungles, cutting and conveying timber	166	643	187	958	964	967	962	959	1,448	6,149	61,380
Constructing an experimental pier	- -	- -	- -	- -	350	—	—	—	—	—	—
Purchase of buildings	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	10,776
TOTAL	16,75,336	12,66,188	17,13,896	12,54,929	12,50,495	15,87,271	18,83,852	24,90,152	23,31,173	21,81,719	24,50,342

Appendix (Z.)

STATEMENT of the Results obtained from EXPENDITURE for extending IRRIGATION in the Districts under the *Madras* Presidency, from 1836 to 1849.

Number.	WORK.	2. First Cost.	3. Subsequent Repairs.	Aggregate Net Increase of Revenue since Improvement. 4. In how many Years.	5. Revenue.	Average Amount Profit or Loss after deducting Repair. 6. Profit.	7. Loss.	Aggregate Net Profit or Loss by the Work. 8. Profit.	9. Loss.	Annual Per Centage on the First Cost after deducting the Amount of Repairs. 10. Profit.	11. Loss.
	Rajahmundry:	*Rs.*	*Rs.*		*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*
1.	Tholiah Bagah	8,204	27,647	5	45,684	3,607	-	9,833	-	44	—
2.	Samulcota Channel	13,472	14,200	5	66,446	10,449	-	38,774	-	$77\frac{9}{16}$	—
3.	Boopiah Calwah										
4.	Gosta Nuddee										
5.	Apparow Calwah	19,259	13,626	10	1,89,755	17,613	-	1,56,870	-	$91\frac{7}{16}$	—
6.	Woosalamurroo Calwah, and other minor Channels connected with these four										
	Masulipatum:										
7.	Pullairoo Channel	13,713	24,634	14	3,86,410	25,841	-	3,48,063	-	188	—
8.	Boodemair Channel	8,099	2,677	12	5,802	260	-	-	4,974	$3\frac{1}{8}$	—
9.	Apparow Channel	8,756	5,770	10	2,32,867	22,710	-	2,18,341	-	$259\frac{3}{8}$	—
	Guntoor:										
10.	Toongabudra Channel	34,214	39,709	7	1,53,820	16,302	-	79,897	-	$47\frac{5}{8}$	—
11.	Coochenapoody Tank supplying Channel	366	1,837	4	4,725	722	-	2,522	-	$197\frac{1}{4}$	—
12.	Vellatoor Channel from the Kistna	7,087	9,400	13	91,165	6,290	-	74,678	-	$88\frac{3}{4}$	—
13.	Moonnunghy Channel from the Kistna	11,858	-	-	-	-	-	-	11,858	—	—
14.	Ivany Tank	3,806	6,670	12	6,338	-	28	-	4,138	-	$-\frac{3}{4}$
	Nellore:										
15.	Veroor River Channel	1,751	335	4	9,575	2,310	-	7,489	-	132	—
	Cuddapah:										
16.	Tungatoor Dyke	3,954	318	5	5,037	944	-	765	-	24	—
	Bellary:										
17.	Numbulgherry Tank	3,201	-	7	4,304	615	-	1,103	-	19	—
	Chingleput:										
18.	Spring Channel for the supply of Poosevakum Tank	1,602	-	3	493	164	-	-	1,109	10	—
19.	Re-opening a River Channel for the supply of the Manapaukum Tank	1,494	421	3	2,061	527	-	146	-	35	—
20.	Porel Tank supply Channel	10,686	5,039	13	43,112	2,929	-	27,387	-	$27\frac{1}{2}$	—
	South Arcot:										
21.	Lower Anicut and dependent Works	74,234	39,972	14	14,22,971	98,786	-	13,08,765	-	$133\frac{1}{16}$	—
22.	Vellar Anicut	82,919	8,037	5	92,651	16,923	-	1,695	-	$20\frac{3}{8}$	—
23.	Ragavien's Channel	13,603	285	4	10,391	2,527	-	-	3,497	$18\frac{9}{16}$	—
	Carried forward	3,22,278	2,00,577	-	27,73,607	2,29,519	28	22,76,328	25,576	—	—

Appendix (Z.)—*continued.*

STATEMENT of the Results obtained from Expenditure for extending Irrigation, &c.—*continued.*

Number.	1. WORK.	2. First Cost.	3. Subsequent Repairs.	Aggregate Net Increase of Revenue since Improvement. 4. In how many Years.	5. Revenue.	Average Amount Profit or Loss after deducting Repair. 6. Profit.	7. Loss.	Aggregate Net Profit or Loss by the Work. 8. Profit.	9. Loss.	Annual Per Centage on the First Cost after deducting the Amount of Repairs. 10. Profit.	11. Loss.
		Rs.	*Rs.*		*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*
	Brought forward - -	3,22,278	2,00,577	- -	27,73,607	2,29,519	28	22,76,328	25,576	—	—
	Salem:										
24.	Extending Mahadevy Tank	1,803	32	5	1,173	228	- -	- -	662	$12\frac{5}{8}$	—
	Tanjore:										
25.	Upper Coleroon Anicut -	83,401	2,72,381	15	20,82,910	1,20,702	- -	17,27,128	- -	$144\frac{11}{16}$	—
26.	South Rajah Voykal -	60,754	66,124	14	1,89,157	8,788	- -	62,279	- -	$14\frac{7}{16}$	—
	Trichinopoly:				Decrease.						
27.	New Iyen Voykal - -	11,328	12,837	14	5,180	- -	1,287	- -	29,345	- -	$11\frac{3}{8}$
28.	Ruttnagoody Anicut and Nuttud Nullah -	10,949	3,156	3	4,396	413	- -	- -	9,709	$3\frac{3}{4}$	—
	Coimbatore:										
29.	Extension of Poolavalungal Channel - -	2,483	1,455	8	4,936	435	- -	998	- -	$17\frac{1}{2}$	—
30.	Nunjah Pagalore Channel Improvement - -	4,884	3,206	13	17,687	1,114	- -	9,597	- -	$22\frac{3}{4}$	—
31.	Wall in front of Calingaroyen Anicut, and widening Kunnandoray Aqueduct - -	4,532	14,998	13	35,913	1,609	- -	16,383	- -	$35\frac{1}{2}$	—
32.	Pillycor Tandinany and Sanapa reddy Auxiliary Tanks and Coyenbully Channels - - -	6,511	3,226	13	76,206	5,614	- -	66,469	- -	$86\frac{2}{16}$	—
	Madura:										
33.	Under sluice and wall to an Anicut across Vigay River - - -	2,466	6,113	13	34,863	2,211	- -	26,284	- -	$89\frac{5}{8}$	—
	Tinnevelly:										
34.	Adacharry Channel -	6,552	962	7	11,341	1,483	- -	3,827	- -	$22\frac{5}{8}$	—
35.	Valathacolum Tank -	1,453	67	5	1,794	345	- -	274	- -	$23\frac{3}{4}$	—
36.	Teroovengadanathapoorum Tank - - -	643	- -	4	4,190	1,048	- -	3,547	- -	163	—
37.	Autoor Tank Improvements - - -	3,242	6,857	11	40,532	3,061	- -	30,433	- -	$94\frac{3}{8}$	—
38.	Maranthy New Channel	10,400	722	14	13,245	894	- -	2,123	- -	$8\frac{9}{16}$	—
39.	Thirteen Small Works -	7,437	55	4	2,408	588	- -	- -	5,084	$7\frac{7}{8}$	—
	Grand Total - -	5,41,116	5,92,768	- -	52,94,358	3,78,052	1,315	42,25,670	70,376	—	—
	Deduct decrease - -	- -	- -	- -	5,180	1,315	- -	70,376	—	—	—
	Net Profit - -	- -	- -	- -	52,89,178	3,76,737	- -	41,55,294	- -	$69\frac{1}{2}$	—

Appendix (A A.)

STATEMENT, showing the CHARGES incurred in the Repair and Construction of PUBLIC WORKS under the Board of Revenue, in the Ten years 1841 to 1850, with the cost of Superintendence.

YEARS.	Total Expenditure on Works of Irrigation, Roads, Civil Buildings, &c.	Superintendence.									Total.	Per Centage.
		Department of Public Works at the Presidency.	Civil Engineers.		Assistant Civil Engineers.		Surveyors.	Overseers.	Officers Superintending Roads, &c.	Maramut Sibbendy Establishment.		
			Officers.	Establishment.	Officers.	Establishment.						
	Rs.	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*
1841 - - -	8,88,378	24,597	76,334	12,928	19,266	1,015	25,825	- -	11,314	49,550	2,20,829	24¾
1842 - - -	8,96,041	19,815	75,194	13,685	20,130	1,910	28,307	- -	11,667	50,412	2,21,120	24⅝
1843 - - -	7,98,064	20,573	77,122	13,712	23,953	3,693	32,428	- -	10,215	49,533	2,31,229	29
1844 - - -	9,32,216	19,691	77,817	13,748	18,320	3,975	29,942	- -	7,989	51,039	2,22,522	23¾
1845 - - -	7,63,040	20,366	75,011	13,437	20,856	5,202	35,214	- -	13,343	51,791	2,35,220	30 13/16
1846 - - -	7,26,376	20,824	79,096	13,811	24,576	6,660	35,669	- -	14,700	53,777	2,49,114	34¼
1847 - - -	9,54,763	24,066	77,867	13,985	36,731	9,689	38,542	7,760	16,553	54,833	2,80,027	29 6/16
1848 - - -	12,61,941	23,008	79,196	14,599	49,297	14,991	39,421	13,597	20,196	55,407	3,09,712	24½
1849 - - -	9,73,345	22,622	80,975	14,018	49,586	15,806	37,587	13,975	20,376	57,953	3,12,897	32⅛
1850 - - -	*12,10,861	22,028	82,554	14,633	46,931	16,264	36,360	13,489	16,625	58,904	3,07,789	25⅜
Average for the 10 Years - -	9,40,502	21,759	78,117	13,856	30,965	7,920	33,929	12,205	14,297	53,320	2,59,046	27½

* Approximate expenditure.

Appendix (B B.)

STATEMENT, showing the REVENUE from the WORKS connected with the Anicut in the District of *Trichinopoly*, for the Twenty Fuslies from 1240 to 1259, as well as the Annual Average Price of Paddy in the Town of *Trichinopoly* for the Forty-two Fuslies from 1219 to 1260.

FUSLIES.	Part of Conaud Talook, watered by Channels taken off from the Cauvery below the Anicut.		Lalgoody Talook, watered by Channels taken off at the Anicut.		Average Annual Price of Paddy per Garce.					
	Cultivation.	Revenue.	Cultivation.	Revenue.	Fuslies.	Price.		Fuslies.	Price.	
	Cawnies.	*Rs.*	*Cawnies.*	*Rs.*		*Rs.*	*a.*		*Rs.*	*a.*
1240 - - -	3,646	32,752	26,492	2,14,648	1219 - -	84	13	1240 - -	78	6
1241 - - -	3,676	32,733	26,474	2,14,727	1220 - -	77	7	1241 - -	75	1
1242 - - -	3,575	32,563	26,229	2,13,339	1221 - -	94	15	1242 - -	98	—
1243 - - -	3,595	31,864	26,484	2,16,217	1222 - -	111	1	1243 - -	142	13
1244 - - -	3,576	29,426	26,685	2,17,251	1223 - -	97	11	1244 - -	114	13
1245 - - -	3,409	27,785	26,690	2,16,028	1224 - -	90	15	1245 - -	84	6
1246 - - -	3,236	25,415	26,554	2,12,347	1225 - -	69	1	1246 - -	116	11
1247 - - -	3,452	28,425	26,789	2,12,061	1226 - -	70	—	1247 - -	119	12
1248 - - -	3,393	27,821	27,017	2,14,285	1227 - -	69	6	1248 - -	103	1
1249 - - -	3,447	28,292	27,177	2,14,540	1228 - -	76	12	1249 - -	85	7
1250 - - -	3,498	28,500	27,350	2,15,153	1229 - -	77	7	1250 - -	69	12
1251 - - -	3,463	27,914	27,264	2,13,836	1230 - -	80	12	1251 - -	67	15
1252 - - -	3,422	26,796	26,661	2,07,297	1231 - -	88	1	1252 - -	71	3
1253 - - -	3,399	26,311	25,887	1,99,146	1232 - -	93	7	1253 - -	82	1
1254 - - -	3,339	25,801	25,656	1,97,615	1233 - -	111	13	1254 - -	90	4
1255 - - -	3,363	25,973	25,716	1,99,068	1234 - -	134	11	1255 - -	107	3
1256 - - -	3,456	27,123	26,489	2,07,166	1235 - -	116	14	1256 - -	134	14
1257 - - -	3,583	27,360	27,037	2,12,430	1236 - -	102	5	1257 - -	104	15
1258 - - -	3,507	27,458	27,377	2,15,324	1237 - -	74	13	1258 - -	77	13
1259 - - -	3,486	27,277	27,487	2,14,674	1238 - -	92	1	1259 - -	80	7
					1239 - -	93	5	1260 - -	74	14

Appendix (C C.) - - - - - - - -

STATEMENT, showing the Quantity and Value of SALT sold for Home and Inland Consumption, in

Fuslies.	Ganjam.		Vizagapatam.		Rajahmundry.		Masulipatam.		Guntoor.		Nellore.		Chingleput.		Madras.	
	Quantity.	Price.	Quantity.	Price.	Quantity.	Price.	Quantity.	Price.	Quantity.	Price.	Quantity.	Price.	Quantity.	Price.	Quantity.	Price.
	Garce.	*Rs.*	*Garce.*	*Rs.*	*Garce.*	*Rs.*	*Garce.*	*Rs.*	*Garce.*	*Rs.*	*Garce.*	*Rs.*	*Garce.*	*Rs.*	*Garce.*	*Rs.*
1241 -	2,427	2,54,815	945	99,259	1,815	1,90,537	1,944	2,04,162	3,669	3,85,212	3,798	3,98,773	4,283	4,49,665	785	82,38
1242 -	2,409	2,52,953	827	86,846	1,291	1,35,543	1,289	1,35,307	1,523	1,59,885	3,118	3,27,429	4,051	4,25,383	767	80,51
1243 -	3,151	3,30,903	1,110	1,16,565	1,011	1,06,171	1,949	2,04,603	2,839	2,98,138	3,942	4,13,881	5,340	5,60,677	823	86,44
1244 -	2,741	2,87,754	1,188	1,24,712	1,382	1,45,103	2,481	2,60,462	2,183	2,29,243	3,349	3,51,607	4,765	5,00,377	751	78,90
1245 -	2,389	2,50,865	830	87,136	1,252	1,31,429	2,041	2,14,283	2,374	2,49,224	3,184	3,34,350	4,078	4,28,223	734	77,10
Average	2,623	2,75,458	980	1,02,904	1,350	1,41,757	1,941	2,03,763	2,518	2,64,340	3,478	3,65,208	4,503	4,72,865	772	81,06
1246 -	2,493	2,61,790	804	84,463	1,279	1,34,287	2,476	2,55,800	2,269	2,38,220	3,466	3,63,975	4,322	4,53,726	733	77,01
1247 -	2,721	2,85,664	1,475	1,54,833	1,433	1,50,439	2,263	2,37,603	2,786	2,92,485	3,436	3,60,792	4,039	4,22,932	847	87,95
1248 -	3,095	3,24,951	1,297	1,36,145	1,278	1,34,171	2,205	2,31,548	3,197	3,35,495	3,706	3,89,178	4,372	4,58,434	908	95,30
1249 -	2,752	2,88,913	1,435	1,50,708	1,231	1,29,305	2,628	2,75,937	3,450	3,53,573	3,823	4,01,462	3,861	4,04,509	1,008	1,05,80
1250 -	2,269	2,38,254	1,432	1,50,326	1,119	1,17,537	2,368	2,48,628	2,842	2,91,900	3,401	3,57,154	3,758	3,93,679	914	96,00
Average	2,660	2,79,914	1,289	1,35,295	1,268	1,33,148	2,388	2,49,903	2,909	3,02,335	3,566	3,74,512	4,070	4,26,656	882	92,41
1251 -	2,499	2,62,437	1,299	1,36,358	1,529	1,60,503	2,501	2,62,590	2,891	3,03,525	4,076	4,27,896	3,702	3,87,613	893	93,79
1252 -	2,807	2,94,785	906	95,180	1,279	1,34,311	3,117	3,27,268	2,636	2,76,821	3,675	3,85,375	3,096	3,24,109	928	97,46
1253 -	2,211	2,54,551	975	1,12,617	1,544	1,75,042	2,454	2,70,312	2,903	3,46,141	3,583	4,19,098	3,476	3,74,503	1,016	1,26,73
1254 -	2,497	3,02,755	884	1,08,755	1,273	1,64,643	2,725	3,29,963	2,912	3,55,142	3,514	4,30,559	3,257	4,00,154	964	1,22,08
1255 -	2,300	2,75,987	909	1,09,130	1,168	1,40,211	3,355	4,02,548	2,876	3,45,132	4,877	5,85,265	3,828	4,59,388	866	1,03,92
Average	2,463	2,78,103	995	1,12,408	1,359	1,54,942	2,830	3,18,536	2,844	3,25,352	3,945	4,49,639	3,472	3,89,153	937	1,08,80
1256 -	2,278	2,73,319	1,022	1,22,613	1,660	1,99,179	2,315	2,77,769	2,589	3,10,730	4,152	4,98,183	3,316	3,97,942	2,196	2,62,28
1257 -	2,402	2,88,257	868	1,04,162	1,528	1,83,390	2,384	2,86,094	3,270	3,87,006	4,543	5,42,841	2,982	3,57,892	2,280	2,73,60
1258 -	2,293	2,75,130	1,038	1,24,623	1,479	1,77,429	2,588	3,10,586	3,467	4,06,734	4,042	4,82,293	1,942	2,33,129	3,131	3,74,86
1259 -	2,401	2,88,060	1,180	1,41,653	1,616	1,93,907	2,165	2,59,831	3,279	3,84,632	4,009	4,77,171	2,539	3,04,691	3,353	4,02,30
1260 -	2,399	2,86,660	1,162	1,39,439	1,577	1,89,210	2,335	2,80,171	3,545	4,12,917	3,673	4,37,074	2,091	2,50,471	4,156	4,98,71
Average	2,355	2,82,285	1,054	1,26,498	1,572	1,88,623	2,357	2,82,890	3,230	3,80,404	4,084	4,87,512	2,574	3,08,825	3,023	3,62,35

Appendix (C C.)

he several Maritime Districts of the *Madras* Presidency, from Fusly 1241 to 1260.

North Arcot.		South Arcot.		Tanjore.		Madura.		Tinnevelly.		Canara.		Malabar.		Total.		Fuslies.
an-ty.	Price.	Quantity.	Price.	Quantity.	Price.	Quantity.	Price.	Quantity.	Price.	Quantity.	Price.	Quantity.	Price.	Quantity.	Price.	
rce.	*Rs.*	*Garce.*	*Rs.*	*Garce.*	*Rs.*	*Garce.*	*Rs.*	*Garce.*	*Rs.*	*Garce.*	*Rs.*	*Garce.*	*Rs.*	*Garce.*	*Rs.*	
214	22,509	1,828	1,91,924	3,592	3,77,154	2,410	2,53,026	1,868	1,96,191	2,362	2,48,831	2,369	2,48,325	34,309	36,02,771	1241
127	13,311	1,734	1,82,055	3,584	3,76,322	2,153	2,26,033	1,719	1,80,516	2,438	2,56,977	2,385	2,49,820	29,415	30,88,890	1242
85	8,880	1,696	1,78,043	3,848	4,04,064	2,057	2,15,567	1,782	1,87,096	2,777	2,92,545	2,725	2,85,715	35,135	36,89,290	1243
106	11,135	1,749	1,83,668	3,875	4,06,618	2,352	2,46,204	1,978	2,07,705	2,597	2,73,471	2,632	2,75,867	34,129	35,82,826	1244
127	13,302	1,342	1,40,892	3,886	4,06,900	2,246	2,35,090	2,201	2,31,076	2,605	2,74,438	2,863	2,99,908	32,152	33,74,223	1245
132	13,827	1,670	1,75,316	3,757	3,94,212	2,244	2,35,184	1,910	2,00,517	2,556	2,69,252	2,595	2,71,927	33,028	34,67,600	Average.
177	18,620	1,067	1,12,066	3,737	3,91,165	2,352	2,46,388	2,285	2,39,959	2,423	2,54,401	2,663	2,79,198	32,546	34,11,072	1246
280	29,413	2,572	2,70,028	4,061	4,25,568	2,381	2,49,593	2,320	2,43,858	2,786	2,92,573	3,265	3,42,132	36,665	38,45,867	1247
306	32,142	2,089	2,19,358	4,049	4,24,321	2,439	2,55,272	2,350	2,46,713	2,812	2,95,227	3,292	3,45,104	37,395	39,23,363	1248
204	21,373	1,853	1,94,606	4,139	4,33,754	2,497	2,61,243	2,266	2,37,951	3,109	3,26,459	3,305	3,46,535	37,561	39,32,134	1249
348	36,491	1,450	1,52,301	3,741	3,91,431	2,644	2,76,736	2,447	2,56,895	2,989	3,13,876	3,340	3,49,965	35,062	36,71,175	1250
263	27,608	1,806	1,89,672	3,945	4,13,248	2,463	2,57,846	2,334	2,45,075	2,824	2,96,507	3,173	3,32,587	35,846	37,56,722	Average.
191	20,039	1,402	1,47,244	3,716	3,88,741	2,566	2,68,572	2,331	2,44,776	3,038	3,19,036	3,043	3,18,866	35,677	37,41,990	1251
306	32,156	1,830	1,92,119	3,591	3,75,849	2,613	2,73,440	2,395	2,56,022	3,126	3,28,283	3,243	3,39,991	35,548	37,33,176	1252
185	19,540	1,706	1,76,569	3,414	4,04,095	2,255	2,69,176	2,269	2,59,169	2,905	3,28,767	2,658	3,07,714	33,554	38,44,027	1253
229	27,712	2,011	2,58,058	3,674	4,64,995	2,770	3,50,577	2,390	3,10,490	3,409	4,13,792	3,206	3,90,660	35,735	44,30,337	1254
250	29,998	2,151	2,58,122	3,795	4,55,409	2,764	3,31,726	2,437	2,95,685	3,550	4,25,974	2,537	3,02,298	37,663	45,20,799	1255
232	25,889	1,820	2,06,422	3,638	4,17,818	2,594	2,98,698	2,364	2,73,228	3,206	3,63,170	2,937	3,31,906	35,635	40,54,066	Average.
87	10,492	2,089	2,40,927	4,131	4,95,708	3,274	3,92,874	2,572	3,08,693	3,660	4,39,203	2,891	3,46,182	38,232	45,76,097	1256
126	15,138	1,682	2,01,794	4,000	4,80,052	2,651	3,18,073	2,355	2,82,624	4,169	4,99,570	3,055	3,65,687	38,295	45,86,180	1257
99	11,937	1,544	1,85,265	3,854	4,62,535	2,693	3,23,135	2,517	3,01,992	3,717	4,45,503	3,025	3,62,387	37,429	44,77,538	1258
158	18,970	1,809	2,17,080	4,010	4,91,994	2,924	3,50,826	2,592	3,10,985	3,790	4,54,175	2,811	3,36,574	38,636	46,32,854	1259
152	18,283	2,345	2,81,428	4,263	5,11,156	2,455	2,94,630	2,925	3,50,973	3,860	4,62,429	2,833	3,39,463	39,771	47,53,015	1260
124	14,964	1,894	2,25,299	4,052	4,88,289	2,799	3,35,908	2,592	3,11,053	3,839	4,60,176	2,923	3,50,059	38,473	46,05,137	Average.

Appendix (D D.)

DETAILED STATEMENT, showing the Distribution of the proposed ESTABLISHMENT of all Grades in the PUBLIC WORKS DEPARTMENT.

	COMMISSIONED OFFICERS.								Warrant and Non-Commissioned.			NATIVE.					OFFICE ESTABLISHMENT.												GRAND TOTAL.
	Chief Engineer, &c.	Inspecting Engineers.	District Engineers.	Assistant District Engineers.	Special Assistant-Deputy Engineers.	Executive Officers. Permanent.	Executive Officers. Occasional.	TOTAL.	Sub-Engineers.	Overseers and Sub-Overseers.	TOTAL.	Superintendents of Maramut.	Deputy-Superintendents of Maramut.	Foremen and Sub-Foremen.	Surveyors.	TOTAL.	Managers.	Draughtsmen, with Printer and Pressman.	Estimate Makers.	Writers.	Accountants.	Gomastahs.	Moochies and Dufterbunds.	Lascars.	Peons.	Sweeper and Toty.	TOTAL.	
GENERAL DEPARTMENT:																													
Chief Engineer, Adjutant, and Department, with Lithographic Press.	2	–	–	–	–	–	–	2	–	2	2	–	–	2	–	2	1	15	3	11	2	–	2	–	7	2	43	49
Two Members of Board of Public Works and a Secretary	3	–	–	–	–	–	–	3	–	–	–	–	–	–	–	–	2	2	7	23	–	–	3	2	2	2	43	46
TOTAL	5	–	–	–	–	–	–	5	–	2	2	–	–	2	–	2	3	17	10	34	2	–	5	2	9	4	86	95
INSPECTING DEPARTMENT:																													
1.—1st Division; Ganjam, Vizagapatam and Rajahmundry.	–	1	–	–	–	–	–	1	–	–	–	–	–	1	1	2	–	2	1	3	2	–	1	4	–	–	13	16
2.—2d Ditto - Masulipatam and Guntoor with the Hyderabad Military Division.	–	1	–	–	–	–	–	1	–	–	–	–	–	1	1	2	–	2	1	3	2	–	1	4	–	–	13	16
3.—3d Ditto - Cuddapah, Nellore and Kurnool -	–	1	–	–	–	–	–	1	–	–	–	–	–	1	1	2	–	2	1	3	2	–	1	4	–	–	13	16
4.—4th Ditto - Bellary and Canara - - -	–	1	–	–	–	–	–	1	–	–	–	–	–	1	1	2	–	2	1	3	2	–	1	4	–	–	13	16
5.—5th Ditto - North Arcot, Chingleput and Madras	–	1	–	–	–	–	–	1	–	–	–	–	–	1	1	2	–	2	1	3	2	–	1	4	–	–	13	16
6.—6th Ditto - Salem and South Arcot - -	–	1	–	–	–	–	–	1	–	–	–	–	–	1	1	2	–	2	1	3	2	–	1	4	–	–	13	16
7.—7th Ditto - Tanjore and Trichinopoly - -	–	1	–	–	–	–	–	1	–	–	–	–	–	1	1	2	–	2	1	3	2	–	1	4	–	–	13	16
8.—8th Ditto - Coimbatore and Malabar - -	–	1	–	–	–	–	–	1	–	–	–	–	–	1	1	2	–	2	1	3	2	–	1	4	–	–	13	16
9.—9th Ditto - Madura and Tinnevelly - -	–	1	–	–	–	–	–	1	–	–	–	–	–	1	1	2	–	2	1	3	2	–	1	4	–	–	13	16
10.—Presidency Division - - - - - -	–	1	–	–	–	–	–	1	1	1	2	–	–	1	–	1	–	2	1	3	2	–	1	–	3	–	12	16
11.—Mysore Division and Territories - - -	–	1	–	–	–	–	–	1	–	1	1	–	–	1	–	1	–	2	1	3	2	–	1	–	3	–	12	15
12.—Saugor Division with Nagpore - - - -	–	1	–	–	–	–	–	1	–	1	1	–	–	1	–	1	–	2	1	3	2	–	1	–	3	–	12	15
13.—Inspector of Railways - - - - - -	–	1	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
TOTAL	–	13	–	–	–	–	–	13	1	3	4	–	–	12	9	21	–	24	12	36	24	–	12	36	9	–	153	191
COLLECTORATES:																													
Ganjam - - - - - - - - -	–	–	1	1	–	–	–	2	2	2	4	1	–	14	4	19	–	2	5	3	2	11	–	10	2	–	35	60
Vizagapatam - - - - - - - -	–	–	1	1	–	–	–	2	2	2	4	1	–	16	4	21	–	2	5	3	2	13	–	10	2	–	37	64
Rajahmundry - - - - - - - -	–	–	1	1	–	–	–	2	3	3	6	1	1	22	5	29	–	2	6	3	2	18	–	12	3	–	46	83

Masulipatam	–	–	1	1	–	–	–	2	2	2	4	1	1	16	4	22	–	2	5	3	2	14	–	10	3	–	39	67
Guntoor	–	–	1	1	–	–	–	2	2	2	4	1	1	20	4	26	–	2	5	3	2	18	–	10	3	–	43	75
Nellore	–	–	1	1	–	–	–	2	2	2	4	1	1	21	4	27	–	2	5	3	2	19	–	10	3	–	44	77
Bellary	–	–	1	1	–	–	–	2	3	3	6	1	1	25	5	32	–	2	6	3	2	21	–	12	3	–	49	89
Cuddapah	–	–	1	1	–	–	–	2	3	3	6	1	1	25	5	32	–	2	6	3	2	21	–	12	3	–	49	89
Chingleput	–	–	1	1	–	–	–	2	1	2	3	1	–	16	3	20	–	2	4	3	2	14	–	8	2	–	35	60
North Arcot	–	–	1	1	–	–	–	2	2	3	5	1	1	16	4	22	–	2	5	3	2	13	–	10	3	–	38	67
South Arcot	–	–	1	1	–	–	–	2	2	3	5	1	1	22	4	28	–	2	5	3	2	19	–	10	3	–	44	79
Salem	–	–	1	1	–	–	–	2	2	2	4	1	1	16	4	22	–	2	5	3	2	14	–	10	3	–	39	67
Tanjore	–	–	1	1	–	–	–	2	3	3	6	1	1	23	5	30	–	2	6	3	2	19	–	12	3	–	47	85
Trichinopoly	–	–	1	1	–	–	–	2	2	2	4	1	1	19	4	25	–	2	5	3	2	16	–	10	2	–	40	71
Madura	–	–	1	1	–	–	–	2	2	3	5	1	–	23	4	28	–	2	5	3	2	20	–	10	3	–	45	80
Tinnevelly	–	–	1	1	–	–	–	2	2	2	4	1	1	14	4	20	–	2	5	3	2	12	–	10	3	–	37	63
Coimbatore	–	–	1	1	–	–	–	2	2	2	4	1	1	24	4	30	–	2	5	3	2	22	–	10	3	–	47	83
Canara	–	–	1	1	–	–	–	2	2	2	4	1	1	21	4	27	–	2	5	3	2	19	–	10	3	–	44	77
Malabar	–	–	1	1	–	–	–	2	2	2	4	1	1	14	4	20	–	2	5	3	2	12	–	10	3	–	37	63
Kurnool	–	–	1	1	–	–	–	2	1	1	2	1	–	17	3	21	–	2	4	2	1	15	–	8	2	–	34	59
Madras	–	–	–	–	–	–	–	–	1	–	1	–	–	1	1	2	–	–	1	1	1	1	–	2	1	–	7	10
TOTAL	–	–	20	20	–	–	–	40	43	46	89	20	15	385	83	503	–	40	103	60	40	331	–	206	56	–	836	1,468
MILITARY EXECUTIVE DEPARTMENT:																														
1. For the Four Districts in Mysore	–	–	4	–	–	–	–	4	–	4	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8
2. Presidency Executive Department	–	–	–	–	–	1	–	1	–	3	3	–	–	6	–	6	–	3	2	5	6	–	1	–	–	–	17	27
3. Saugor Division and Nerbudda Territories	–	–	–	–	–	4	–	4	–	6	6	–	–	8	–	8	–	4	4	8	–	–	–	–	8	–	24	42
4. Bangalore	–	–	–	–	–	1	–	1	–	1	1	–	–	2	–	2	–	1	1	2	–	–	–	–	2	–	6	10
5. Straits of Malacca	–	–	–	–	–	1	–	1	–	1	1	–	–	2	–	2	–	1	1	2	–	–	–	–	2	–	6	10
6. Tenasserim Coast	–	–	–	–	–	1	–	1	–	2	2	–	–	2	–	2	–	1	1	2	–	–	–	–	2	–	6	10
7. Hyderabad Subsidiary Force	–	–	–	–	–	1	–	1	–	2	2	–	–	2	–	2	–	1	1	2	–	–	–	–	2	–	6	11
8. Nagpore Subsidiary Force	–	–	–	–	–	1	–	1	–	2	2	–	–	2	–	2	–	1	1	2	–	–	–	–	2	–	6	11
9. Cannanore	–	–	–	–	–	1	–	1	–	2	2	–	–	2	–	2	–	1	1	2	–	–	–	–	2	–	6	11
10. Neilgherry Hills Works	–	–	–	–	–	1	–	1	–	2	2	–	–	2	–	2	–	1	1	2	–	–	–	–	2	–	6	11
11. Head Quarters Mysore Division of the Army	–	–	–	–	–	–	–	–	–	1	1	–	–	2	–	2	–	1	–	–	1	–	–	–	2	–	4	7
12. Head Quarters Centre Division of the Army	–	–	–	–	–	–	–	–	–	1	1	–	–	2	–	2	–	1	–	–	1	–	–	–	2	–	4	7
13. Head Quarters Ceded Districts	–	–	–	–	–	–	–	–	–	1	1	–	–	2	–	2	–	1	–	–	1	–	–	–	2	–	4	7
14. Head Quarters Malabar and Canara	–	–	–	–	–	–	–	–	–	1	1	–	–	2	–	2	–	1	–	–	1	–	–	–	2	–	4	7
15. Head Quarters of the Southern Division of the Army	–	–	–	–	–	–	–	–	–	1	1	–	–	2	–	2	–	1	–	–	1	–	–	–	2	–	4	7
16. Presidency Roads	–	–	–	–	–	–	–	–	–	1	1	–	–	3	–	3	–	–	–	–	–	–	–	–	–	–	–	4
17. Military Cantonment Roads	–	–	–	–	–	–	–	–	–	5	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5
TOTAL	–	–	4	–	–	12	–	16	–	35	35	–	–	41	–	41	–	19	13	27	11	–	1	–	32	–	103	195
ROADS AND COMMUNICATIONS:																														
District Roads and other Works	–	–	–	–	–	–	14	14	–	–	–	–	–	14	–	14	–	–	–	14	–	–	–	–	–	–	14	42
Main Roads	–	–	–	–	–	–	16	16	16	18	34	–	–	50	16	66	–	–	16	16	–	–	–	32	–	–	64	180
Special Projects	–	–	–	–	9	–	–	9	20	20	40	–	–	49	29	78	–	9	29	9	–	–	–	76	–	–	123	250
TOTAL	–	–	–	–	9	12	30	39	36	38	74	–	–	113	45	158	–	9	45	39	–	–	–	108	–	–	201	472
GRAND TOTAL	5	13	24	20	9	12	30	113	80	124	204	20	15	553	137	725	3	109	183	196	77	331	18	352	106	4	1,379	2,421

Appendix (E E.)

MEMORANDUM, showing the Numbers and Grades of SUBORDINATES and OFFICE ESTABLISHMENT allotted to each Officer, &c., being the Scale by which the Number and Distribution of the various Inferior Grades, as shown in the foregoing Table, have been determined.

No.	OFFICERS, &c.	For one of each Officer, &c. or Department.													Total for the whole Number of Officers, &c.	Total for each description of Officers, &c.	Grand Total, including Officers, &c.
		Foremen and Sub-Foremen.	Surveyors.	Managers.	Draughtsmen, with Printer and Pressmen.	Estimate Makers.	Writers.	Accountants.	Gomastahs.	Moochees and Dufterbunds.	Lascars.	Peons.	Sweeper and Toty.	Total.			
	Chief Engineer, &c.:																
1	Chief Engineer	2	–	1	12	3	11	2	–	2	–	6	2	41	41		
–	Lithographic Department	–	–	–	3	–	–	–	–	–	–	–	1	4	4		
1	Adjutant of Engineers	–	–	–	–	–	–	–	–	–	–	–	–	–	–		
2																45	47
	Two Members of Board of Works and Secretary:																
3	Civil Branch	–	–	–	2	7	20	–	–	3	2	2	2	38	38		
	Military Branch	–	–	2	–	–	3	–	–	–	–	–	–	–	5		
																43	46
	Inspecting Engineers:																
9	Nine Divisions, Nos. 1 to 9	1	1	–	2	1	3	2	–	1	4	–	–	15	135		
3	Three Divisions, Nos. 10 to 12	1	–	–	2	1	3	2	–	1	–	3	–	13	39		
1	Inspector of Railways, No. 13	–	–	–	–	–	–	–	–	–	–	–	–	–	–		
13																174	187
	District Engineers:																
20	Twenty Collectorates	1	1	–	2	2	1	–	–	–	3	–	–	10	200		
4	Four Districts in Mysore	–	–	–	–	–	–	–	–	–	–	–	–	–	–		
24																200	224
	Assistant District Engineers:																
20	Twenty Collectorates	1	1	–	–	1	–	–	–	–	3	–	–	6	120		
																120	140
	Special Assistant District Engineers:																
9	Special Projects	1	1	–	1	1	1	–	–	–	4		–	9	81		
																81	90
	Permanent Executive Officers:																
1	Presidency, in the Military Executive Department	6	–	–	3	2	5	6	–	1	–	–	–	23	23		
4	Saugor Division and Nerbudda Territories in ditto	2	–	–	1	1	2	–	–	–	–	2	–	8	32		
7	Seven Stations, Nos. 4 to 10 in ditto	2	–	–	1	1	2	–	–	–	–	2	–	8	56		
12																111	128
	Occasional Executive Officers:																
14	Roads and other works	1	–	–	–	–	1	–	–	–	–	–	–	2	28		
16	Main Roads	1	1	–	–	1	1	–	–	–	2	–	10	6	96		
30																124	154
	Sub Engineers:																
1	Presidency Division in the Inspecting Department	–	–	–	–	–	–	–	–	–	–	–	–	–	–		
43	Twenty-one Collectorates	1	1	–	–	1	–	–	–	–	2	–	–	5	215		
16	Main Roads	1	–	–	–	–	–	–	–	–	–	–	–	1	16		
20	Special Projects	1	1	–	–	1	–	–	–	–	1	–	–	4	80		
80																311	391
	Overseers:																
2	Chief Engineer	–	–	–	–	–	–	–	–	–	–	–	–		–		
3	Divisions Nos. 10 to 12 in the Inspecting Department	–	–	–	–	–	–	–	–	–	–	–	–	–	–		
46	Twenty Collectorates	1	–	–	–	–	–	–	–	–	–	–	–	1	46		
24	Ten Stations in the Military Executive Department, from Nos. 1 to 10	–	–	–	–	–	–	–	–	–	–	–	–	–	–		
5	Five Stations in the Military Executive Department, from Nos. 11 to 15	2	–	–	1	–	–	1	–	–	–	2	–	6	30		
1	Presidency Roads in the Military Executive Department, No. 16	3	–	–	–	–	–	–	–	–	–	–	–	–	3		
5	Military Cantonment Roads, No. 17	–	–	–	–	–	–	–	–	–	–	–	–	–	–		
18	Main Roads	1	–	–	–	–	–	–	–	–	–	–	–	1	18		
20	Special Projects	1	–	–	–	–	–	–	–	–	1	–	–	2	40		
124																137	261
20	Superintendents of Maramut	–	–	–	–	–	–	–	1	–	–	1	–	2	40		
																40	60
15	Deputy Superintendents of Maramut	–	–	–	–	–	–	–	1	–	–	1	–	2	30		
																30	45
–	Twenty Collectorates	–	–	–	–	–	2	2	2	–	–	1	–	7	140	140	140
–	256 Talooks of those Collectorates	1	–	–	–	–	–	–	1	–	–	–	–	2	512	512	512
–	The Madras Collectorate	–	–	–	–	–	–	–	–	–	–	1	–	1	1	1	1
352														Total		2,069	2,421

Appendix (F F.)

SYNOPSIS of the proposed ESTABLISHMENT of all Grades in the PUBLIC WORKS DEPARTMENT.

	Class.	Number in each Class.	Number in each Grade.	Monthly. For One of each Class.	Monthly. For each Class.	Annual. For One of each Class.	Annual. For each Class.
				Rs. a. p.	*Rs. a. p.*	*Rs. a. p.*	*Rs. a. p.*
Chief Engineer	–	–	1	—	—	—	—
Adjutant of Engineers	–	–	1	—	—	—	—
Members of the Board	–	–	2	1,100 – –	2,200 – –	13,200 – –	26,400 – –
Secretary to the Board	–	–	1	500 – –	500 – –	6,000 – –	6,000 – –
Inspecting Engineers	1st	1	–	1,000 – –	1,000 – –	12,000 – –	12,000 – –
	2d	12	13	821 10 8	9,860 – –	9,860 – –	1,18,320 – –
District Engineers	1st	8	–	591 4 –	4,730 – –	7,095 – –	56,760 –
	2d	8	–	491 4 –	3,930 – –	5,895 – –	47,160 – –
	3d	8	24	391 4 –	3,130 – –	4,695 – –	37,560 – –
Assistant District Engineers	–	–	20	160 13 4	3,216 10 8	1,930 – –	38,600 – –
Special Assistant District Engineers 9 Permanent Exect. Officers 12 Occasional Exect. Officers 30 Total 51	1st	1	–	600 – –	600 – –	7,200 – –	7,200 – –
	2d	8	–	491 4 –	3,930 – –	5,895 – –	47,160 – –
	3d	18	–	341 4 –	6,142 8 –	4,095 – –	73,710 – –
	4th	24	51	210 13 4	5,060 – –	2,530 – –	60,720 – –
Total Commissioned	–	–	113	6,699 9 4	44,299 2 8	80,395 – –	5,31,590 – –
Sub-Engineers	1st	10	–	431 12 –	4,317 8 –	5,181 – –	51,810 – –
	2d	30	–	301 5 –	9,039 6 –	3,615 12 –	1,08,472 8 –
	3d	40	80	176 5 –	7,052 8 –	2,115 12 –	84,630 – –
Overseers	1st	30	–	145 14 –	4,376 4 –	1,750 8 –	52,515 – –
	2d	30	60	105 10 6	3,169 11 –	1,267 14 –	38,036 4 –
Sub-Overseers	1st	32	–	76 11 9	2,455 8 –	920 13 –	29,466 – –
	2d	32	64	52 12 8	1,689 5 4	633 8 –	20,272 – –
Total Warrant and Non-Commissioned	–	–	204	1,290 6 11	32,100 2 4	15,485 3 –	3,85,201 12 –
Superintendents of Maramut	1st	10	–	120 – –	1,200 – –	1,440 – –	14,400 – –
	2d	10	20	90 – –	900 – –	1,080 – –	10,800 – –
Deputy Superintendents of Maramut	–	–	15	60 – –	900 – –	720 – –	10,800 – –
Foremen	1st	65	–	40 – –	2,600 – –	480 – –	31,200 – –
	2d	85	–	35 – –	2,975 – –	420 – –	35,700 – –
	3d	101	251	30 – –	3,030 – –	360 – –	36,360 – –
Sub-Foremen	1st	100	–	25 – –	2,500 – –	300 – –	30,000 – –
	2d	100	–	20 – –	2,000 – –	240 – –	24,000 – –
	3d	102	302	15 – –	1,530 – –	180 – –	18,360 – –
Surveyors	1st	40	–	20 – –	800 – –	240 – –	9,600 – –
	2d	45	–	15 – –	675 – –	180 – –	8,100 – –
	3d	52	137	10 – –	520 – –	120 – –	6,240 – –
Total Native	–	–	725	480 – –	19,630 – –	5,760 – –	2,35,560 – –
Total Professional	–	–	1,042	8,470 – 3	96,029 5 –	1,01,640 3 –	11,52,351 12 –
OFFICE ESTABLISHMENTS.							
Managers	1st	1	–	150 – –	150 – –	1,800 – –	1,800 – –
	2d	1	–	130 – –	130 – –	1,560 – –	1,560 – –
	3d	1	3	105 – –	105 – –	1,260 – –	1,260 – –
Draughtsmen, including Printers and Pressmen	1st	1	–	140 – –	140 – –	1,680 – –	1,680 – –
	2d	1	–	100 – –	100 – –	1,200 – –	1,200 – –
	3d	2	–	65 – –	130 – –	780 – –	1,560 – –
	4th	10	–	55 – –	550 – –	660 – –	6,600 – –
	5th	20	–	35 – –	700 – –	420 – –	8,400 – –
	6th	25	–	25 – –	625 – –	300 – –	7,500 – –
	7th	50	109	15 – –	750 – –	180 – –	9,000 – –
Carried forward	–	112	112	820 – –	3,380 – –	9,840 – –	40,560 – –

Appendix (F F.)—*continued.*

SYNOPSIS of the proposed Establishment of all Grades in the Public Works Department—*continued.*

	Class.	Number in each Class.	Number in each Grade.	Monthly. For One of each Class.	Monthly. For each Class.	Annual. For One of each Class.	Annual. For each Class.
				Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Brought forward	–	112	112	820 – –	3,380 – –	9,840 – –	40,560 – –
Estimate Makers	1st	1	– –	100 – –	100 – –	1,200 – –	1,200 – –
	2d	2	– –	70 – –	140 – –	840 – –	1,680 – –
	3d	4	– –	50 – –	200 – –	600 – –	2,400 – –
	4th	20	– –	30 – –	600 – –	360 – –	7,200 – –
	5th	50	– –	20 – –	1,000 – –	240 – –	12,000 – –
	6th	106	183	14 – –	1,484 – –	168 – –	17,808 – –
Writers	1st	5	– –	70 – –	350 – –	840 – –	4,200 – –
	2d	21	– –	50 – –	1,050 – –	600 – –	12,600 – –
	3d	40	– –	35 – –	1,400 – –	420 – –	16,800 – –
	4th	75	– –	28 – –	2,100 – –	336 – –	25,200 – –
	5th	55	196	16 – –	880 – –	192 – –	10,560 – –
Accountants	1st	2	– –	50 – –	100 – –	600 – –	1,200 – –
	2d	5	– –	40 – –	200 – –	480 – –	2,400 – –
	3d	10	– –	24 – –	240 – –	288 – –	2,880 – –
	4th	20	– –	18 – –	360 – –	216 – –	4,320 – –
	5th	40	77	12 – –	480 – –	144 – –	5,760 – –
Gomastahs	1st	21	– –	30 – –	630 – –	360 – –	7,560 – –
	2d	260	– –	15 – –	3,900 – –	180 – –	46,800 – –
	3d	50	331	10 – –	500 – –	120 – –	6,000 – –
Moochees and Dufterbunds	1st	4	– –	15 – –	60 – –	180 – –	720 – –
	2d	4	– –	10 – –	40 – –	120 – –	480 – –
	3d	10	18	7 – –	70 – –	84 – –	840 – –
Lascars	1st	50	– –	8 – –	400 – –	96 – –	4,800 – –
	2d	150	– –	7 – –	1,050 – –	84 – –	12,600 – –
	3d	152	352	6 – –	912 – –	72 – –	10,944 – –
Peons	1st	6	– –	10 – –	60 – –	120 – –	720 – –
	2d	20	– –	7 – –	140 – –	84 – –	1,680 – –
	3d	20	– –	6 – –	120 – –	72 – –	1,440 – –
	4th	30	– –	5 – –	150 – –	60 – –	1,800 – –
	5th	30	106	4 – –	120 – –	48 – –	1,440 – –
Sweepers and Toty	1st	2	– –	3 – –	6 – –	36 9 –	72 – –
	2d	2	4	2 8 –	5 – –	30 – –	60 – –
Total Office Establishments	–	– –	1,379	1,592 8 –	22,227 – –	19,110 – –	2,66,724 – –
Probable cost of the College of Civil Engineering	–	– –	– –	– – –	– – –	– – –	50,000 – –
GRAND TOTAL	–	– –	2,421	10,062 8 3	1,18,256 5 –	1,20,750 3 –	14,69,075 12 –

Note.—The amounts set down in the above Table as the salaries of the Commissioned and Non-Commissioned Officers consist of various items; the following Memo. gives the particulars.

OFFICERS.	Class.	Pay.	Staff Pay.	Tentage.	House Rent.	Batta.	Compensation in lieu of Rations.	TOTAL Monthly for each.
COMMISSIONED:		Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs.	Rs. a. p.	Rs. a. p.	Rs. p.
Member of the Board	– –	– – –	1,100 – –	– – –	–	– – –	– – –	1,100 – –
Secretary to the Board	– –	– – –	500 – –	– – –	–	– – –	– – –	500 – –
Inspecting Engineer	1st	– – –	1,000 – –	– – –	–	– – –	– – –	1,000 – –
	2d	– – –	700 – –	121 10 8	–	– – –	– – –	821 10 8
District Engineer	1st	– – –	500 – –	91 4 –	–	– – –	– – –	591 4 –
	2d	– – –	400 – –	91 4 –	–	– – –	– – –	491 4 –
	3d	– – –	300 – –	91 4 –	–	– – –	– – –	391 4 –
Assistant District Engineer	– –	– – –	100 – –	60 13 4	–	– – –	– – –	160 13 4
Special Assistant District Engineer and Executive Officer	1st	– – –	600 – –	– – –	–	– – –	– – –	600 – –
	2d	– – –	400 – –	91 4 –	–	– – –	– – –	491 4 –
	3d	– – –	250 – –	91 4 –	–	– – –	– – –	341 4 –
	4th	– – –	150 – –	60 13 4	–	– – –	– – –	210 13 4
WARRANT AND NON-COMMISSIONED:								
Sub-Engineer	1st	– – –	250 – –	– – –	60	121 12 –	– – –	431 12 –
	2d	– – –	150 – –	– – –	60	91 5 –	– – –	301 5 –
	3d	50 – –	– – –	– – –	35	91 5 –	– – –	176 5 –
Overseer	1st	50 – –	– – –	– – –	35	60 14 –	– – –	145 14 –
	2d	30 – –	– – –	– – –	30	45 10 6	– – –	105 10 6
Sub-Overseer	1st	26 7 4	43 15 1	– – –	–	– – –	6 5 4	76 11 9
	2d	26 7 4	20 – –	– – –	–	– – –	6 5 4	52 12 8

Appendix (G G.)

STATEMENT of the POPULATION of the TERRITORIES of the *Madras* Presidency, according to the Census taken in the Revenue Year 1850–51.

DISTRICTS.	ADULTS.								
	MALES.			FEMALES.			TOTAL.		
	Hindoos.	Mahomedans and others.	TOTAL.	Hindoos.	Mahomedans and others.	TOTAL.	Hindoos.	Mahomedans and others.	TOTAL.
1. Ganjam - -	282,650	1,616	284,266	295,110	1,984	297,093	577,760	3,600	581,360
2. Vizagapatam -	397,463	4,815	402,278	411,715	5,425	417,140	809,178	10,240	819,418
3. Rajahmundry -	322,316	6,726	329,042	339,613	7,171	346,784	661,929	13,897	675,826
4. Masulipatam -	176,167	7,323	183,490	166,497	7,639	174,136	342,664	14,962	357,626
5. Guntoor - -	168,461	10,578	179,039	168,061	10,586	178,647	336,522	21,164	357,686
6. Nellore - -	312,213	14,060	326,273	294,920	12,946	307,866	607,133	27,006	634,139
7. Bellary - -	394,108	29,404	423,512	374,459	28,619	403,078	768,567	58,023	826,590
8. Cuddapah -	147,959	29,762	477,721	430,283	28,773	459,056	878,242	58,535	936,777
9. Chingleput -	191,239	6,144	197,383	183,947	5,928	189,875	375,186	12,072	387,258
10. North Arcot -	465,620	22,361	487,981	450,896	24,159	475,055	916,516	46,520	963,036
11. South Arcot -	359,431	13,637	373,068	327,508	12,742	340,250	686,939	26,379	713,318
12. Salem - -	380,945	9,965	390,910	383,418	9,962	393,380	764,363	119,927	884,290
13. Tanjore - -	523,970	44,036	568,006	542,731	50,407	593,138	1,066,701	94,443	1,161,144
14. Trichinopoly -	184,741	57,390	242,131	188,027	57,418	245,445	372,768	114,808	487,576
15. Madura - -	532,214	53,705	585,919	552,737	56,304	609,041	1,084,951	110,009	1,194,960
16. Tinnevelly -	361,946	39,785	401,731	387,630	45,001	432,631	749,576	84,786	834,362
17. Coimbatore -	357,473	8,207	365,680	381,239	8,637	389,876	738,712	16,844	755,556
18. Canara - -	314,921	34,775	349,696	315,383	34,856	350,239	630,304	69,631	699,935
19. Malabar - -	358,361	125,432	483,793	371,933	128,683	500,616	730,294	254,115	984,409
20. Kurnool - -	74,525	14,019	88,544	73,679	14,674	88,353	148,204	28,693	176,897
TOTAL - -	6,606,723	533,740	7,140,463	6,639,786	551,914	7,191,700	13,246,509	1,185,654	14,432,163
21. Madras - -	—	—	—	—	—	—	—	—	—
GRAND TOTAL	6,606,723	533,740	7,140,463	6,639,786	551,914	7,191,700	13,246,509	1,185,654	14,432,163

Appendix (G G.)—*continued.* - - - - - - - -

STATEMENT of the Population of the Territories of the *Madras* Presidency,

DISTRICTS.	CHILDREN.								
	MALES.			FEMALES.			TOTAL.		
	Hindoos.	Mahomedans and others.	TOTAL.	Hindoos.	Mahomedans and others.	TOTAL.	Hindoos.	Mahomedans and others.	TOTAL.
1. Ganjam - -	190,334	845	191,179	153,738	653	154,391	344,072	1,498	345,570
2. Vizagapatam -	240,019	3,026	243,045	189,393	2,416	191,809	429,412	5,442	434,854
3. Rajahmundry -	181,872	3,789	185,661	147,409	3,140	150,549	329,281	6,929	336,210
4. Masulipatam -	91,049	4,665	95,714	64,083	3,443	67,526	155,132	8,108	163,240
5. Guntoor - -	103,893	7,531	111,424	94,227	6,631	100,858	198,120	14,162	212,282
6. Nellore - -	151,425	7,720	159,145	135,476	6,930	142,406	286,901	14,650	301,551
7. Bellary - -	202,446	17,413	219,859	168,203	14,947	183,150	370,649	32,360	403,009
8. Cuddapah -	261,011	20,389	281,400	216,551	17,193	233,744	477,562	37,582	515,144
9. Chingleput -	102,649	3,673	106,322	86,740	3,142	89,882	189,389	6,815	196,204
10. North Arcot -	261,060	13,674	274,734	236,262	11,841	248,103	497,322	25,515	522,837
11. South Arcot -	152,293	6,726	159,019	127,766	5,902	133,668	280,059	12,628	292,687
12. Salem - -	212,700	6,262	218,962	187,013	5,102	192,115	399,713	11,364	411,077
13. Tanjore - -	249,934	23,180	273,114	221,556	20,272	241,828	471,490	43,452	514,942
14. Trichinopoly -	88,425	29,769	118,194	76,861	26,565	103,426	165,286	56,334	221,620
15. Madura - -	268,998	28,206	297,204	239,982	24,645	264,627	508,980	52,851	561,831
16. Tinnevelly -	207,188	27,804	234,992	176,884	22,978	199,862	384,072	50,782	434,854
17. Coimbatore -	206,504	4,944	211,448	182,698	4,160	186,858	389,202	9,104	398,306
18. Canara - -	171,715	21,358	193,073	145,063	18,262	163,325	316,778	39,620	356,398
19. Malabar - -	200,823	79,316	280,139	181,095	69,266	250,361	381,918	148,582	530,500
20. Kurnool - -	43,037	8,948	51,985	36,841	7,467	44,308	79,878	16,415	96,293
TOTAL - -	3,587,375	319,238	3,906,613	3,067,841	274,955	3,342,796	6,655,216	594,193	7,249,409
21. Madras - -	- -	- -	- -	- -	- -	- -	- -	- -	- -
GRAND TOTAL	3,587,375	319,238	3,906,613	3,067,841	274,955	3,342,796	6,655,216	594,193	7,249,409

Appendix (G G.)—*continued.*

according to the Census taken in the Revenue Year 1850–51—*continued.*

TOTAL OF ADULTS AND CHILDREN.						GRAND TOTAL.			Area in Square Miles.	No. of Persons to each Square Mile.
HINDOOS.			MAHOMEDANS AND OTHERS.							
Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.		
472,984	448,848	921,832	2,461	2,637	5,098	475,445	451,485	926,930	6,400	145
637,482	601,108	1,238,590	7,841	7,841	15,682	645,323	608,949	1,254,272	7,650	164
504,188	487,022	991,210	10,515	10,311	20,826	514,703	497,333	1,012,036	6,050	167
267,216	230,580	497,796	11,988	11,082	23,070	279,204	241,662	520,866	5,000	104
272,354	262,288	534,642	18,109	17,217	35,326	290,463	279,505	569,968	4,960	115
463,638	430,396	894,034	21,780	19,876	41,656	485,418	450,272	935,690	7,930	118
596,554	542,662	1,139,216	46,817	43,566	90,383	643,371	586,228	1,229,599	13,056	94
708,970	646,834	1,355,804	50,151	45,966	96,117	759,121	692,800	1,451,921	12,970	112
293,888	270,687	564,575	9,817	9,070	18,887	303,705	279,757	583,462	3,020	193
726,680	687,153	1,413,838	36,035	36,000	72,035	762,715	723,158	1,485,873	6,800	218
511,724	455,274	966,998	20,363	18,644	39,007	532,087	473,918	1,006,005	7,610	132
593,645	570,431	1,164,076	16,227	15,064	31,291	609,872	585,495	1,195,367	8,200	146
773,904	764,287	1,538,191	67,216	70,679	137,895	841,120	834,966	1,676,086	3,900	430
273,166	264,888	538,054	87,159	83,983	171,142	360,325	348,871	709,196	3,000	236
801,212	792,719	1,593,931	81,911	80,949	162,860	883,123	873,668	1,756,791	10,700	164
569,134	564,514	1,133,648	67,589	67,979	135,568	636,723	632,493	1,269,216	5,700	223
563,977	563,937	1,127,914	13,151	12,797	25,948	577,128	576,734	1,153,862	8,280	139
486,636	460,446	947,082	56,133	53,118	109,251	542,769	513,564	1,056,333	7,720	137
559,184	553,028	1,112,212	204,748	197,949	402,697	763,932	750,977	1,514,909	6,060	250
117,562	110,520	228,082	22,967	22,141	45,108	140,529	132,661	273,190	3,243	84
10,194,098	9,707,627	19,901,725	852,978	826,869	1,679,847	11,047,076	10,534,496	21,581,572	138,249	156
- -	- -	- -	- -	- -	- -	- -	- -	700,000	30	23,333
10,194,098	9,707,627	19,901,725	852,978	826,869	1,679,847	11,047,076	10,534,496	22,281,572	138,279	161

Appendix (H H.)

ABSTRACT of the present ESTABLISHMENT of the MARAMUT DEPARTMENT in all its Branches.

No.		Rs. a. p.	Rs. a. p.
	Board of Works:		
1	Secretary	9,600 – –	
2	Overseer and Assistant Overseers	1,234 10 –	
39	Office Establishment	15,164 – –	
			25,998 10 –
	Civil Engineer's Department:		
8	Civil Engineers	78,720 – –	
22	1st and 2d Assistant Civil Engineers	60,960 – –	
25	Revenue Surveyors, Assistant and Sub-Assistant Revenue Surveyors	35,583 – –	
22	Assistant Overseers	11,600 14 –	
227	Native Establishment	38,724 8 –	
			2,25,588 6 –
	Collector's Establishment:		
18	Maramut Superintendents and Deputies	11,340 – –	
97	1st, 2d and 3d Class Maistries	22,035 – –	
107	Talook Maramut Gomastahs	11,967 – –	
26	District Establishment	7,227 – –	
		52,569 – –	
	Local and variable Establishment in 13 Districts	8,158 10 2	
			60,727 10 2
	Military Department:		
11	Chief Engineer and Officers	1,24,212 6 –	
18	Warrant and Non-Commissioned Officers	12,856 13 –	
105	Office Establishment for Chief Engineer, &c. and Cantonment Roads	49,834 – –	
	Watering and Scavengers' Carts	2,555 15 –	
103	Lascars' Establishment	6,151 – –	
120	Establishment of Artificers	6,720 – –	
		2,02,330 2 –	
	Deduct Regimental Pay and Allowances	62,734 15 –	
		1,39,595 3 –	
5	Office Establishment in the Engineering Department of the Military Board Office	3,464 – –	
19	Establishment of the Government Road Department	1,482 – –	
			1,44,541 3 –
	Road Department:		
2	Superintendent and Assistant Superintendent of Roads	22,804 8 –	
17	Overseers and Assistant Overseers and Supervisors	9,327 12 –	
37	Native Establishment	5,947 1 –	
		38,079 5 –	
14	Officers in charge of Roads and Ghauts, including Railway Commissioner	63,545 – –	
			1,01,624 5 –
	Saugor and Mhow Range for Military and Civil Works, exclusive of Agra, and Bombay Road, Royapore or Mail Road, the Great Deccan Road, and District Roads:		
3	Executive Officers (exclusive of Inspecting Engineers)	14,400 – –	
3	Overseers and Assistant Overseers	1,920 – –	
46	Native Establishment	4,074 – –	
	Maintaining Mhow Cantonment Roads	600 – –	
			20,994 – 9
	TOTAL per Annum – – – *Rs.*		5,79,474 2 2

Appendix (II.)

Memorandum on the Cochrane Canal.

1. The Pulicat Lake is a backwater or lagoon to the northward of Madras. It is about 50 miles in length north and south, by 15 miles broad, east and west, in the widest part, and its southern extremity is about 20 miles from Madras. The Ennore Backwater is a similar lagoon of smaller dimensions, lying between the Pulicat Lake and Madras, and about 12 miles in length. In 1801, the Government of Madras planned a canal to connect Madras with the Ennore Backwater, and invited tenders for the execution of the work. A Mr. J. L. Heefke made an offer, which was accepted; Mr. Basil Cochrane being surety for the performance of the stipulated conditions. The terms were the exclusive possession of the canal by the contractor for 45 years, with right to levy toll on all goods carried upon it, at certain rates laid down; while the work was in progress, it occurred to the contractor that it would be a great improvement to cut a second canal, to join the Ennore Backwater to the Pulicat Lake; and he obtained a contract for that also, on terms similar to the former. Description of the canal.

The work was completed in 1806; and on the 14th October of that year, formal articles of agreement were executed between the Government of Madras and Mr. Heefke, embodying the points above detailed, stipulating that the canals should be maintained in efficient working condition by the lessees during the currency of the lease, and be entirely surrendered to Government in good order at its close; and providing that the term of 45 years should commence from the 1st November 1802. It was formed by private capital.

2. Although Mr. Cochrane was ostensibly only the surety, he was, in fact, the principal contractor, Mr. Heefke's interest in the contract, if any, being very small; and not long after the completion of the work, whatever rights were possessed by the latter, appear to have been conveyed to Mr. Cochrane, who thus became the sole proprietor. After the departure of this gentleman from Madras, the management of the canal was entrusted to his agents, Messrs. Arbuthnot & Co.; and the canal having been allowed to fall somewhat into disrepair, so as to diminish its usefulness, a negotiation was opened, in 1836, with the object of transferring to Government the remainder of the lessee's interest in it. The transfer of possession was made on the 1st April 1837; Government engaging, pending the final arrangement of the terms of the purchase, to pay annually the amount of the average yearly net profits from the canal during the preceding 11 years. The equivalent ultimately agreed on was the value of an annuity of this amount for the remaining period of the lease. How and when it came into the hands of the Government.

3. As soon as the canal came into the hands of Government, a member of the Board of Revenue, Mr. Charles Cotton, was deputed to examine the canal and the lakes, with the view of ascertaining what improvements could be made in it, or in the mode of working it. Mr. Cotton recommended a number of improvements; some of which were adopted and carried into effect. The most important of those adopted were as follows:— Measures then adopted.

1st. Deepening shallow parts of the canal and lakes.

2d. Reducing the number of Government demands on goods carried on the canal from four to one.

3d. Establishing a fixed tariff for goods, the old one being incomplete and uncertain; and abolishing the toll of three fanams or about four annas, previously paid by every passenger on the canal, which appears to have been felt as a great hardship.

Other recommendations of still more importance, having in view the improvement of the canal, were not acted on.

The tariff of tolls then established has remained in force down to the present time, with a few trifling modifications and reductions made in 1846.

4. The water communication by the canal and the Pulicat Lake extends to Sooloorpett, a place on the great Northern Road, near the western shore of the lake, and 50 miles from Madras. But though the road from that place to the Presidency is very bad, so bad in parts as not to deserve the name of road at all,* the canal is but little used for goods or travellers coming or going on that line; and by far the greater part of the traffic on it is the transport to Madras of firewood from the jungles on the eastern side of the lake, and of cockle-shells, which are found in beds near its southern and south-western shores, and which are carried to Madras to be converted into fine plaister. Government salt is also brought by the canal to Madras for sale from the pans at Ennore; a small quantity of grain comes from the northern parts of the lake; and a variety of trifling articles of daily consumption are brought from places near the canal, between Pulicat and Madras. The use of the canal is limited at present.

5. All the boats in use on the canal are private property, and the mode in which Government derives income from the canal is by means of toll levied on the goods conveyed. The boats Description and number of the boats in use.

* For a great part of the distance, and even to within a few miles of Madras, this road is not practicable for carts, except in very fine weather. Piece goods coming to Madras from Nellore, 110 miles distant, and situated on the Northern road, are carried all the way by men.

Appendix (II.)

boats are of various kinds and sizes; those plying between Madras and the northern parts of the Pulicat Lake are called northern boats; the largest of these are 50 feet long, 12½ broad, draw about 2½ feet water when loaded, and carry 15 tons; and the smallest are of such a size as to carry about five tons. These boats are about 270 in number.

There is also a smaller class of boat built and owned at Pulicat, and called top boats; these are used chiefly for the conveyance of passengers, being furnished, as their name implies, with a top or awning. There are now above 50 of these boats in constant use, though in 1837, before the abolition of the passenger toll, there were only three. There are also a few boats called budgerows, provided with cabins for the accommodation of passengers of the more wealthy class.

Canal management.

6. The canal is immediately managed, under the Collector of Madras, by a superintendent and a few other servants for collecting the toll at the Madras Basin. And there is also an European Assistant Overseer in charge of a dredge on the lake; but the dredge was damaged in the gale in May 1851, and has since been useless.

The receipts and charges.

The following Statement shows the receipts and charges of the canal since it came into the possession of Government.

Fuslies.	Annual Receipts.	CHARGES.				Net Receipts.
		Establishment and Saderward.	Repairs.	Amount paid to the Lessee.	Total.	
	Rs. a. p.	*Rs. a. p.*	*Rs. a. p.*	*Rs. a. p.*	*Rs. a. p.*	*Rs. a. p.*
1246 - -	5,916 9 5	559 15 2	574 1 –	- - -	1,134 – 2	4,782 9 3
1247 - -	26,234 6 11	2,519 8 8	1,228 6 6	9,374 7 8	13,122 6 10	13,112 – 1
1248 - -	24,371 2 –	2,768 – 9	1,356 5 4	14,061 11 7	18,186 1 8	6,185 – 4
1249 - -	31,893 13 –	2,815 12 3	883 10 9	14,061 11 7	17,761 2 7	14,132 10 5
1250 - -	30,623 – 6	2,722 15 2	4,638 7 –	14,061 11 7	21,423 1 9	9,199 14 9
1251 - -	27,539 12 4	2,731 1 3	- - -	14,061 11 7	16,792 12 10	10,746 15 6
1252 - -	25,337 15 2	2,778 5 1	505 9 –	14,061 11 7	17,345 9 8	7,992 5 6
1253 - -	33,773 1 8	2,728 9 –	826 13 –	14,061 11 7	17,617 1 7	16,156 – 1
1254 - -	32,084 10 3	2,711 5 7	1,035 15 6	14,061 11 7	17,809 – 8	14,275 9 7
1255 - -	23,484 11 11	2,751 4 4	230 8 –	36,047 – 6	39,028 12 10	} 8,248 8 11
1256 - -	31,642 – 2	2,262 11 –	5,586 11 4	- - -	7,849 6 4	
1257 - -	33,169 7 11	2,164 15 1	283 4 4	- - -	2,448 3 5	30,721 4 6
1258 - -	31,473 11 6	2,145 4 6	211 7 7	- - -	2,356 12 1	29,116 15 5
1259 - -	31,635 1 3	2,159 10 –	575 15 5	- - -	2,735 9 5	28,899 7 10
1260 - -	32,515 11 8	2,147 – –	1,022 9 9	- - -	3,169 9 9	29,346 1 11
Total - *C. Rs.*	4,21,695 3 8	35,966 5 10	18,959 12 6	1,43,853 9 3	1,98,779 11 7	2,22,915 8 1

Note.—The canal was only in possession of Government three months and 11 days in Fusly 1246.

The comparatively limited use made of the canal appears to be owing to two causes; the uncertainty and delay of the navigation, which is often altogether interrupted through the shallowness of the channel, and the complicated system of tolls. The great variation in the receipts from year to year appears to be owing entirely to the former cause; the canal being navigable for a longer period in some years than in others. We shall notice, 1st. The improvement of the canal and navigation; and 2d. The improvement of the management, and especially of the system of levying the tolls.

Defective state of the Navigation.

7. The largest boats used on the canal draw only two-and-a-half feet of water, as already said; yet there are many shallow places, both in the lakes and in the canals, where it often happens that there is not sufficient depth of water for boats. At such times either the boats are of necessity laid up and not used at all, or they take only a half or a quarter of a cargo; or if it is in the canal, part of the cargo is taken out and deposited on the bank, and the boat after carrying the remainder to Madras, comes back for what has been thus left behind.

The canal was originally made 20 yards wide, and it is now wider from the gradual washing in of the sides, yet it is only in the centre generally that a laden boat can float, and even an empty boat has some difficulty in passing a laden one. It is very desirable that the navigable channel should be made broader. Again, the canal is wholly unprovided with towing-paths. When there is a fair wind, sails are used, but at other times the boats are painfully towed by men who make their way as they best can along the rugged bank, or the muddy edges of the canal; the use of ponies or cattle for towing is unknown. In the lake, either oars or poles are used generally, in the absence of a favourable breeze; but in the shallow parts the boatmen are often obliged to tow the boat walking in the water, and in many places, between Pulicat and Madras, the natural channel through the backwater, winds a great deal, in consequence of sand-banks, which it would cost but little to cut through. The lake and canal are chiefly supplied with water by the Pulicat Bar, when that is open; and if it is opened by a good monsoon it does not close for a year or more. But when two or three successive monsoons are scanty, there is not water enough to force the bar; and then, being fed only by the occasional rains, the lake becomes very shallow. But

even

even when the lake is at the lowest, the additional depth required for navigation does not exceed from one to two feet in any part, and not more than one foot, except for short distances. There would be no difficulty in deepening the shallower parts of the canals, and of the channels in the lake to that extent. Major Smith, of the Engineers, in his report on the project of permanently closing the Pulicat Bar,* points out how easily and cheaply and securely the navigation may be improved in this way.

Repairs required.

8. We are of opinion that this ought certainly to be done, and without delay. The canal should be deepened, wherever required, to such an extent as to have always a depth of at least three feet of water, and that of sufficient width for two laden boats easily to pass; the deepened channel through the shallow parts of the lake should be straightened where necessary, and should be marked out with stakes or beacons; and towing-paths should be formed along the canals, as well as along the edge of the lake and backwater, wherever the navigation channel is sufficiently near the shore.

The basin at Madras is furnished with convenient wharfs; but it is confined in extent even for the present traffic, and the shells, which are brought in vast quantities, are therefore landed outside the basin, being carried from the boats through the shallow and muddy sides of the canal. It is very desirable that the canal should be widened for some little distance, and a wharf formed along one side of it, thus in effect enlarging the basin, and greatly assisting trade.

The small river, about four miles in length, by which boats pass from the lake to Sooloorpett, is in the same defective condition as the canal, but there are some difficulties in the way of improvement here, because it belongs to the Vencatagherry Rajah; we shall speak of this, however, when treating of the system of tolls.

More Engineering superintendence wanted.

9. This navigation certainly requires more and better engineering superintendence than it now has. Geographically, it lies within three jurisdictions; the southern end of the canal is in the Madras Collectorate; thence to Pulicat, and somewhat beyond, it is in the 4th division; and the part of the lake near Sooloorpett is in the 2d division. The Civil Engineers of these two divisions, however, appear to have nothing to do with it; nominally it is under the control of the Secretary to the Board of Revenue in the department of Public Works, but as he is fully occupied by his proper office duties, the only officer of the department really connected with it is the Assistant Revenue Surveyor belonging to the establishment of the Collector of Madras. It is a part of the duty of this officer to go once a month to Ennore, in order to ascertain and report on the condition of the bar at that place; he also reports, at the same time, the "average"† depth of water in the Cochrane Canal, but it does not appear that he ever visits the Cauttoopully Canal or the Pulicat lake, except on some very special occasion. When the water is fallen so low in any part of the navigation as to impede the passage of boats, the Surveyor is sent to make an estimate for clearing out the obstruction. After this estimate has been made, has been submitted to the Board of Revenue through the Collector, and has received their sanction, the execution of the work is ordered; but meanwhile, and until the work is done, traffic on the canal is more or less interrupted.

We think that the canal and its connected works, forming as they do a navigation of 50 miles in length, require the whole attention of one officer, and are of sufficient importance to claim it. And we would recommend that the whole line of the navigation should be made a part of the 4th division, within which by far the greater part of it actually lies; and further, that a Revenue Surveyor or European Overseer‡ should be specially appointed to the exclusive charge, under the Civil Engineer. While the improvements which we have recommended are in progress, even more than this amount of superintendence will be required; and if the works are to be maintained in that efficient condition in which we are anxious to see them, they will require constant attention, and will fully employ an officer of the class we have specified.

The mode of levying the toll on the Cochrane Canal;

10. We have next to speak of the mode of levying toll on the canal; and the present system is extremely inquisitorial, complicated and unequal.

The tariff appears to include all articles whatever that are carried on the canal; it contains 42 separate articles by name, besides the following two very comprehensive items: "Provisions of wines, furniture, trunks, vegetables, curry stuffs, &c.," and "furniture and sundries of all kinds." There are nine different sorts of firewood, liable to different rates of toll, besides three sorts of faggots, liable to different rates; some things, as grain and chunam, are tolled by measurement; some, as straw, and "long sticks," by the bundle, without definition of size; some, as chillies, tamarinds, &c., by the bag, with equal vagueness; some by the cooly load, some by the cart load, and some by tale.

It is obvious that this multiplicity of denominations, and the distinction of so many sorts, throws much power into the hands of the toll collector, and at the same time gives facilities for fraud to the dishonest trader. The present intelligent Superintendent represented this circumstance to the Collector, so long ago as December 1846, being very soon after

* To Board of Revenue D. P. W., 30 March 1839, Para. 11.

† Such is the term used in his reports; but as that information would be totally useless, it is to be supposed that he, in fact, reports the depth at the shallowest parts.

‡ We here use the terms applicable to the present state of the department; if the changes in it recommended by us are made, the officer to be appointed to the canal will be a Sub-Engineer.

Appendix (II.)

after the new tariff was promulgated; and recommended that the proper weights or dimensions of the several indefinite denominations of articles should be determined, according to a scale which he submitted at the same time. This has not been done; but in 1849, on a further application from the Superintendent, the Collector furnished him with scales to weigh the commodities.

Again, we have failed to trace any principle in the amount of toll on the various articles. Properly it ought to vary with the weight or displacement of the goods; but on comparing it with the boat-hire of the articles respectively (and that may be assumed as approximately representing the displacement), we find that it varies from the full amount of the boat-hire to only one-third of it. And it is even bulk for bulk less on some high-priced commodities, as chillies, than on such cheap articles as firewood and chunam shells.

And on the Cauttoopully Canal;

11. The foregoing remarks apply to the toll on the Cochrane Canal only; a totally different system obtains on the Cauttoopully Canal. There the rule is indeed simple, but at the expense of fairness; the toll is 7 annas 6 pice per boat-load, on boats of all sizes and goods of all descriptions, provided only that the goods amount to a cart-load; a smaller quantity passes free. A boat coming from Pulicat, or the northward, pays these two tolls; but if, after passing the Cauttoopully Canal, it lands goods at Ennore, or other place short of Madras, the Cochrane Canal toll is not demanded, but only one-fifth of it, in addition to the Cauttoopully toll of 7 annas 6 pice a boat-load.

And on goods landed at Ennore.

The course observed in cases of this latter kind, which, however, are unfrequent, viz., where goods are to be landed between Cauttoopully and Madras, is not a little troublesome to traders and boatmen. There is a Conocopillay or Clerk stationed at Cauttoopully, the southern end of the Cauttoopully Canal, and a second at Sadiencoopum, the northern end of the Cochrane Canal. When goods brought by Cauttoopully are to be landed at Ennore, the boatmen obtain from the Clerk at the former place a ticket specifying the nature and the quantity of the goods. On arriving at Ennore, one of them leaves the boat, and proceeds on foot to the toll office at Madras, a distance of 12 miles, and delivers the ticket to the Superintendent of the canal; who thereupon sends a written order to the Conocopillay at Sadiencoopum, directing him to go to Ennore (six miles from his post) to inspect and measure the goods and receive the toll. Thus, in order to the levying of this toll, two persons walk a joint distance of 36 miles, and the boat and the cargo are detained probably two days. And after all, what does the toll amount to? We learn from the Superintendent that the principal article landed from the northward at Ennore is faggots, and that only in small quantities. The value of a second-size boat-load of faggots is *Rs.* 90, and the full toll *Rs.* 10. 12. 6.; for such a quantity, then, the toll leviable at Ennore (being one-fifth the full toll) will be *Rs.* 2. 2. 6.; and only *Rs.* 2. 10., with the Cauttoopully toll.

Simplification of the system.

12. The vexatious and tedious and complicated system of levying the toll, is no doubt among the causes why so little use is made of the canal. This cause it is highly desirable to remove, by simplifying the system; and we would effect this simplification by levying the toll in one sum as one charge at the Madras Basin, and there only; and by taking it in a mode as little interfering and annoying as possible.

The Toll at Ennore to be abolished;

We have already explained that by far the greater part of the total collections are even now received at Madras, only an extremely small amount being received at Ennore. The total annual collections at the latter place, on the average of the last five years,* is under *Rs.* 44½; and not to insist on the inconvenience to parties concerned, at which this trifling sum is collected, it does not appear that when the toll at Madras is consolidated into one sum, the Conacapillay at Cauttoopully (whose salary alone is *Rs.* 84 a year) will be required for any other purpose than to secure that very insignificant amount. There seems no reason to suppose that the demand of Ennore for articles brought by the canal will materially increase; and when the toll is reduced, as we shall recommend, there need be no fear that goods will be landed there, and taken by land to Madras to evade the toll, as the advantage will be very greatly in favour of the water carriage, as it is indeed already; we propose, therefore, to discontinue altogether the practice of tolling goods landed at Ennore.

* Fusly.

Fusly.	*Rs.*	*a.*	*p.*
1256	32	6	4
1257	30	15	6
1258	48	2	11
1259	72	3	7
1260	38	10	11
Total -	222	7	10
Average	44	7	10

And the separate toll for the Cauttoopully Canal.

As to the toll levied at Madras, we propose that the separate toll now levied for using the Cauttoopully Canal should be discontinued. In point of fact, almost all the boats which arrive at or leave Madras pass through both canals, and in the case of such the separation is simply troublesome, without any advantage whatever; and as respects the small remainder which pass between Ennore and other nearer places, and Madras, and so use the Cochrane Canal only, the toll which we shall propose will be so much lighter than what is now paid for passing that canal alone, that the change will still be a great boon to them; and it is of much importance that the tolls should be as simple and intelligible as possible.

New mode of taking the toll at Madras.

13. With regard to the mode of levying the toll, various plans suggested themselves to us; but that which, on the whole, appears to us the best, is to register all the boats plying on the canal, with their measurement and tonnage, and levy a toll of so much a ton on each boat according to its registered tonnage, every time it enters the Madras Basin with a cargo. The advantages of this plan are, that it takes away all plea for the inspection of goods, or the detention of boats in transit; and that it tolls all goods equally, according to their displacement, including passengers who have no good claim to exemption from toll, provided it can be taken, as this plan will take it, without direct or personal interference. The only material objection to which it is open, so far as we are aware, is, that it transfers the demand from the owner of the goods carried to the boat-owner; and that many of the latter class, being men possessed of little property besides their boats, might possibly be driven off the canal

canal by the fear of such liability; but this objection is applicable only to the poorer boatmen; it does not concern the numerous class who own both boat and cargo; and we think that, even with regard to the poorer class, it will be held to be without foundation, when it is considered that the demand will come just at the time that the boat-hire is received, or at least when a part of it may be received.

A minor objection is, that the toll will be the same on half a boat-load of goods as on a whole one; but, practically, we believe that boats are generally fully laden, except when there is too little water; and at those times, if this is ever allowed to happen hereafter, a remission may be allowed; and we shall propose so to lighten the toll, that it will be very light when the boat is only partially filled.

Reason for tolling arrivals only.

14. It may be asked why we propose to toll only boats arriving, and to exempt those leaving; the reason is, that the trade consists almost wholly of imports. In the two Fuslies 1259 and 1260 (the only years in which we have the Imports and Exports separately), the total import toll amounted to *Rs.* 62,638, the export to only *Rs.* 1,513, or less than 2½ per cent. The goods exported are not only small in quantity, in the aggregate, but they are distributed in small portions over a great number of boats; thus the above sum of *Rs.* 1,513 was collected from 3,671 boats. A toll per boat would, therefore, fall very heavily on these goods; or, to avoid that, the mode of transport found most convenient to the traders, must be altered; and further, a toll on exports would expose all boats leaving the basin to examination. Hereafter, when the canal shall have become the great channel of communication with the North, the system now proposed will perhaps need modification; but for the present it seems to us to be decidedly the best.

Other plans noticed.

15. A more perfect plan would, indeed, be to levy a monthly toll from all boats, according to tonnage: this would render the payment certain and invariable; would make the collection easy and simple; and would not only give perfect freedom to the boatman to employ his boat in the most convenient way, but would in a slight degree act as a premium on industry. This plan may be fitly adopted hereafter, when the boatmen shall have become habituated, under our proposed plan, to the payment of toll; at present, we fear that the prospect of periodical demands of toll, irrespectively of the receipts of boat-hire, would have the effects which we have supposed to be objected to the first-mentioned plan; viz., that it would drive the poorer owners off the canal, and would give a monopoly of the business to the more wealthy owners. Further, in the existing uncertain and precarious state of the navigation, a periodical demand would be very unfair, as the parties liable would often be deprived of the means of paying, through the neglect of the parties receiving the toll, viz., the Government, to repair the canal.

A third plan, which came under our discussion, was to toll a few of the principal articles of traffic, and allow all others to go free; but we could devise no simple and compendious method of taking the toll on such commodities; and we were of opinion that no article carried on the canal (not excepting passengers) could fairly claim exemption from toll, provided it could be levied without interference or detention; and this consideration deserves the more weight, because there are several articles, now yielding but little toll, the conveyance of which seems likely to be greatly increased, if the canal is improved.

Rate of toll.

16. It remains to consider what the rate of toll per ton should be; and in order to determine that, it is necessary to decide what shall be the total amount to be levied annually.

The collections and profit hitherto.

Hitherto the canal has been regarded as one of the ordinary sources of revenue; the whole amount collected has been carried to the credit of the Government, and the sums expended on charges and repairs have in like manner been paid out of the general revenue. From the statement given above, in para. 6, it appears that even during the 10 years when the compensation to the lessee was in course of payment, there was a clear gain of *Rs.* 10,005 annually; the average yearly receipts being *Rs.* 28,698, and the average outgoings *Rs.* 18,693. During the last four years, when there was no compensation to pay, the receipts have been on the average *Rs.* 32,198, the charges *Rs.* 2,677, and the net gain *Rs.* 29,521 annually. It further appears that, on the whole, even allowing for the compensation paid to the lessee, Government have derived a clear profit from the canal to the amount of *Rs.* 2,22,915 in little more than 14 years.

The legitimate objects of the toll.

17. Now it appears to us, as stated in our Report, that the instructions of the Honourable Court on the subject of ferries, are equally applicable in principle to canals; and both with reference to those orders, and from general considerations, we think that Government ought not to stoop to derive a revenue from works of this kind, any more than they would wish to do so from a road. We think that the tolls should be fixed at a low rate, in order to afford the greatest amount of facility to traffic; and that the collections should form a separate and distinct fund, to be available, 1st, for the current expenses and repairs; 2d, for the improvement and extension of the work; 3d, for the formation of new similar works in the same district or vicinity; 4th, for making or improving roads or bridges, or otherwise facilitating traffic on the branch roads feeding the canal; and 5th, for aiding such works of the same kind in the same district or vicinity, as may not produce sufficient return for their current expenses, and repairs and necessary improvements. Many lines of canal might now be formed at very moderate cost, which would immediately pay all current expenses, and leave a surplus; and those would thus afford valuable aid to the contributions of Government for improving the internal communications of the country.

Proper cost of establishment.

18. Applying these principles to the case now before us, we find, in the first place, that the capital sunk by Government in the purchase of the canal has been much more than

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than replaced, having been in fact paid out of the receipts from the canal. Further, it appears that the total charges of the canal, including repairs, have averaged only *Rs.* 3,854, but it is certain that far too little has been expended on repairs. This item, therefore, must be increased, and a warrant officer of the Public Works Department, with a small establishment, must be maintained; but, on the other hand, the Toll Office establishment may be reduced, because, under the new arrangements proposed by us, both the work devolving on that establishment, and the amount of the collections, will be diminished. The annexed statement shows in comparison the existing establishment and that which might probably be sufficient if the proposed measures are adopted; the saving amounts to *Rs.* 46 monthly, or *Rs.* 552 on the whole year.

Present Establishment.		Proposed Establishment.		Reduction of Salary.
Officer.	Salary.	Officer.	Salary.	
	R. a. p.		*R. a. p.*	*R. a. p.*
One Superintendent -	70 – –	Superintendent -	70 – –	—
One Assistant ditto -	24 8 –	- - - -	- - -	24 8 –
One Shroff - -	17 8 –	Shroff - - -	17 8 –	—
Conacapillay at the Basin - - -	10 8 –	Conacapillay at the Basin - - -	10 8 –	—
Conacapillay at Cauttoopully - -	7 – –	- - - -	- - -	7 – –
Conacapillay at Sadiencoopum - - -	10 8 –	Conacapillay at Sadiencoopum - -	7 – –	3 8 –
5 Peons, at *Rs.* 7 each	35 – –	4 Peons, *Rs.* 6 each -	24 – –	11 – –
Sweeper - - -	1 8 –	Sweeper - - -	1 8 –	—
Toty - - - -	1 – –	Toty - - -	1 – –	—
Total for a Month -	177 8 –	- - - -	131 8 –	46 – –
Total for a Year -	2,130 – –	- - - -	1,578 8 –	552 – –

We propose to continue the present salary to the Superintendent, as it is important to have a steady and respectable man at the head of the office. The duty of the Conacapillay at Sadiencoopum is to give chits or passes to boats entering the canal from the northward, and to keep a register of them, to prevent their landing their goods on the bank of the canal, and so avoiding the toll. There will be very little inducement to this sort of evasion under the new system as respects goods, and but little more in regard to passengers; it may be well, however, to continue the officer in question for the present.

Total amount required.

19. The following, then, is our estimate of the annual requirements of this canal. Toll establishment, *Rs.* 1,578; probable cost of one Warrant Officer of the Civil Engineer's Department, with the necessary establishment, *Rs.* 2,600; and we judge that if the improvements and repairs now obviously necessary are effected, of which we shall say more presently, and the canal is thus placed in good working order, the annual outlay necessary to keep it so may probably amount to *Rs.* 6,000. These sums make a total of *Rs.* 9,578. We would propose then to fix *Rs.* 20,000 as the gross amount to be raised from the canal annually, being less than two-thirds of the gross collections in late years.

Number and tonnage of boats;

20. The next question is, what rate of toll per ton will be sufficient to afford that income; and in computing this, we shall take only the actual traffic on the canal as far as we can ascertain it, without any allowance for the increase which will certainly follow that improvement of the navigation and reduction of toll which we recommend. And when that increase shall show itself in an excess of the total collection materially above that which we have fixed, we recommend that the rate of toll be somewhat lowered.

Mr. Rozario, the Superintendent of the canal, has prepared for us a statement of the number of boats plying on the canal, and their tonnage, which is as follows:—

Class of Boats.	Number of Boats.	Probable Average Tonnage.	Probable Total Tonnage.
		Tons.	
1st Class - - - -	30	15	1,200
2d Class - - - -	120	12	1,440
3d Class - - - -	70	7	490
4th Class - - - -	90	2	180
5th Class - - - -	60	1	60
Total - -	420	- - -	3,370

The

The statement appears to have been drawn up with much care; and having ourselves gone to the Basin, and taken the measurement of several boats, we are of opinion that in that particular it is rather under than over the truth.

And number of trips made.

With regard to the number of trips made by each boat, Mr. Cotton states it at three a month; but this seems much too high, and at all events the average number made is much smaller. The average number of boats that paid toll in each of the three Fuslies 1258 to 1260 was 7,165, of which 1830 were departures from the Basin, leaving 5,335 arrivals. The boats in question were of the first three classes, as those of the 4th and 5th classes seldom carry goods, but passengers only. The boats of those three classes are 270, and the average number of trips in the year, to each boat, was therefore only 19. As the smaller boats, no doubt, go more frequently than the larger, it is probable that the latter do not make more than 10 or 12 trips a year, and, considering the time necessary for loading and unloading, this number agrees much better with the dilatory working habits of the people of this country than the larger number stated by Mr. Cotton. We may add, that it agrees better also with the moderate number of boats which we found at the Basin.

We think we may safely assume, that every ton of the whole comes to the Basin with a cargo 12 times in the course of the year; and thus we have 37,560 tons in the year. We have also 150 passenger-boats with a united tonnage of 240 tons, each of which probably makes at least 24 trips in the year. This gives a total of 5,760 tons, and with the cargo-boats forms an aggregate of 43,320 tons on which to raise *Rs.* 20,000. We propose, then, that the toll shall be ½ rupee a ton on every laden boat entering the Basin. The term "laden" to extend to boats carrying any quantity of goods, or even a single passenger, for hire.

The use of steamers on the canal.

21. We will only add here, that the slight clearing and deepening which we have spoken of as necessary for the ordinary traffic, would render the navigation perfectly feasible for small screw-steamers, which indeed would draw less water than the common cargo-boats now in use. We have reason to believe that private enterprise would be ready to take advantage of this opening, by placing such small steamers on the line for the conveyance of goods and passengers between Madras and Sooloorpett. The aid afforded by such an improvement to the Northern traffic would be very great; and we would earnestly press the expediency of removing doubts or difficulties from its way, by freely permitting screw-steamers to ply on the canal on payment of the same rate of toll per ton of freightable measurement as is charged on ordinary boats. We say screw-steamers in particular, because vessels so worked damage the banks very little more than tow-boats; paddle-steamers, from their greater width, and from the commotion that they cause, seem unsuitable to this canal.

We think the permission to work screw-steamers on the canal and lake on these terms should be given immediately; leaving it to individual discretion to determine whether to introduce such vessels now, or to wait till the proposed improvements shall have made the waters navigable at all seasons.

Tolls levied by the Vencatagherry Zemindar.

22. There is one circumstance connected with the canal to which we have already adverted, and which forms a serious impediment as well to its present usefulness as to its improvement; we allude to the rights claimed and exercised by the Zemindar of Vencatagherry over all the landing-places used by boats on the West shore of the Pulicat Lake, which lies within his territory. The chief of these landing-places is Sooloorpett, the most distant point of the navigation, and of that we shall mainly speak. Sooloorpett is at some distance from the lake, and it is reached by a small river; and the mouth of this inlet being closed with sand banks, requires to be frequently cleared for the free passage of boats. This part of the navigation is stated to be often interrupted when the water is low. According to a practice of many years' standing, the Zemindar levies a fee or toll on all goods carried on this river or inlet, according to a certain scale, and fees are also levied by the Cavulgars, or hereditary watchers of some adjoining villages.* The rates are not very heavy; but it is stated that much inconvenience is experienced through the detention of goods by the people engaged in the collection. It is easy to see that this demand and the plea for detention which it affords may be made the means of exacting much more than the amount authorized by the Zemindar; and it is expressly stated by the late principal Collector of Nellore (in his letter to the Board of Revenue, Department of Public Works, October 1st, 1840), that this is the case. The toll was at that time rented out by the Zemindar; and the renter and the servants of the Zemindar detained goods, and by that means extorted much more than the proper toll.

Besides Sooloorpett, there are three landing-places in the territory of the Vencatagherry Zemindar, at all of which fees or tolls are levied, varying slightly in amount from those paid at Sooloorpett; at all these places the canals through the shallow border of the lake, by which boats reach the landing-place, were originally excavated, and are now maintained, by the Zemindar.

Former discussions of the subject.

23. This subject was brought to the knowledge of the Board of Trade so long ago as 1813, by the Collector of Nellore; but nothing was done about it, and no further notice taken till 1837, when it was again brought forward by Mr. Charles Cotton, in his memorandum

* The Curnums of the several villages also receive fees on the boats; but the Zemindar declares that these are paid by himself, out of his collections of toll. There is also a small landing-place in the Calastry Zemindary, at which similar tolls and fees are levied to those above described.

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randum on the canal above referred to. The principal Collector was then instructed to communicate with the Zemindar, with the view of putting an end to the collections; and he appears to have used his best endeavours to this end, but without effect. The Zemindar once and again replied that the tolls were his right by long custom, and were secured to him by his Zemindary Sunnud, and that they were paid in consideration of his keeping open the bar and the channel at Sooloorpett, and clearing the cuts at the other landing-places. He also stated that the Cavulgar's fees were paid in consideration of the protection of the merchants' goods from depredation.

Mr. Stonhouse ascertained the annual amount of the Zemindar's collections, over and above the small outgoings, to be about *Rs.* 1,000, and he wished the Zemindar to accept a corresponding reduction of his Peishcush, and surrender the tolls. This, however, the latter pertinaciously refused, alleging indirect advantages to himself from the present system in various ways, all of them obviously enormously exaggerated in amount, and most of them wholly unconnected with the question of tolls.

The tolls appear to be legal.

24. The matter was ultimately allowed to drop, as the Zemindar could not be brought to terms, and it was thought that the validity of his claim could not be gainsaid. Without at all touching the question whether any petty exactions existing in the Zemindary are legal (with which question we have nothing to do), it appears to us that these fees or tolls cannot be denied to be so. It is distinctly stated by Mr. C. Cotton, in his memorandum of June 1837, that in every case in which they are levied, the Zemindar originally made, and still maintains, the improvements by means of which alone those places respectively can be used by boats at all. The payment, therefore, is as strictly a toll for the use of those improvements as the payment at the Madras Basin is a toll for the use of the Cochrane Canal. It is true that the total amount received much exceeds what is expended in repairs, and also that the works are not maintained in perfect order; but both propositions are equally true of the Cochrane Canal and its tolls.

But Government may require him to accept compensation.

25. But though the Zemindar's title to these tolls appears on these grounds to be perfectly valid, yet it seems clear to us that if, from abuses in the mode of collection, or from any other cause, they form practically a material impediment to the public utility of the canal and lake, the Government has an indisputable right to interfere, and compel the Zemindar to receive a fair money equivalent in exchange for his rights, whatever they may be ascertained to be. According to the recognized law and usage of the country, though a declaratory Act, similar to that existing in Bengal, is wanting here (and we understand that the subject is now under consideration), the Government is fully entitled to take such land within a zemindary as may be required for any public purpose, a road, a canal, a railway, or a channel of irrigation, on condition of paying the Zemindar annually the actual yearly value of such land to him; and it seems indisputable, that on this analogy the Government has an equal right to free this important line of communication from obstruction and hindrance by the Zemindar, on paying him the pecuniary value of his interest in such obstructions.

With respect to the roossooms or fees levied by the Cavulgars, they appear to be exactly similar to those formerly levied by the Cavulgars of Pulicat, which were commuted into a money payment from the Treasury some years ago. These also may, it is supposed, be dealt with in the same way.

Some proposed extensions of the navigation.

26. Some suggestions by Mr. Charles Cotton, for extending the canal, have not been acted upon, and it may be useful to notice them here.

The first is a proposal for a channel of six or eight miles along the border of the lake, northward from Cusbah Streehuricottah, where the lake now ceases to be navigable, and where most of the firewood is now put on board the boats. The wood has now to be brought that distance, and much more, by coolies, or on bandies where there are no roads; and it appears, therefore, to be a very desirable improvement: but the extension of the canal, spoken of below in para. 27, includes it, and will render a separate work with that object unnecessary.

With this recommendation was joined another equally worthy of attention; viz., that as the Government jungle available for firewood in that quarter does not exceed from 30 to 40 square miles, and will speedily be destroyed by indiscriminate cutting, it should be divided into eight portions (that being about the number of years in which trees cut grow up again to the proper size for cutting), one of such portions to be cleared every year. A Government tax is levied on the firewood cut, and amounts, on an average of the five years 1843 to 1847, to *Rs.* 7,135 a year; out of this amount, the trifling sum necessary for carrying that proposal into effect might very beneficially be expended. It seems clear that, if the jungle is thus husbanded, the returns of this tax and the supply of firewood will be perpetuated, and will increase; but if not, there is danger that both will decline. Mr. Cotton calculates the value of firewood consumed annually in Madras at 10 lacs of rupees, or 100,000 *l.* sterling, and justly observes how vast a public boon and benefit would be any material reduction of its present high price. There are several sources of supply, and among them the jungles of the Calastry and Vencatagherry Zemindaries. A reduction in the price of that brought from Streehurricottah would most probably lead those proprietors to follow the example, and endeavour to cheapen the conveyance of firewood, by making roads from the jungle to the lake, or otherwise.

A second proposed extension of the canal is by a cut from the Madras Basin to the beach near the Custom-house, a distance of about a mile and a half; we believe that this, though contemplated as a part of the original plan, has recently been discussed and abandoned, from the fear that the salt water of the canal might injure the seven wells which supply the fort

fort with drinking water. It would be a valuable improvement, however; especially in case of the extension of the canal to the northward, and perhaps a line may be selected not open to this objection. It seems very doubtful, however, whether the fear be not altogether chimerical; for the proposed canal would not cross the line by which it must be supposed that water reaches the wells, and it would be far less deep than the wells. We observed a well on the Western Esplanade of the town very much nearer to the salt water of the ditch than the proposed canal would be to the seven wells, and of which the line of supply is directly crossed by the ditch, and which yet appears to be in very extensive use. Instead of yielding to theoretical or imaginary fears, it would be important to inquire whether the water of this well is ever brackish. Appendix (II.)

A third proposal was to deepen the ditch along the western face of the Madras wall, and the Cooum River, where necessary, so as to enable boats to pass from the basin to Chindadrepettah, and to the Mount road near Richardson's shop, at both which places landing-wharfs should be formed; this also appears likely to be useful. Boats can now pass to those points when the river and canal are full, but not at other times; and there is an absence at both places of every sort of convenience for landing or taking in goods.

27. All these three plans, but more especially the first, seem well adapted to increase the usefulness of the canal, and the cost would be trifling. The first and most important is included in a plan recently sanctioned by the Honourable Court of Directors, as we have explained above; the cost of the other two would not be great, probably not exceeding *Rs.* 10,000. We would also recur to the improvements of the existing navigation which we have pointed out above in para. 8, viz., forming towing-paths, deepening the shallow parts of the canal, deepening and straightening the channel through the lake and backwater and marking it with beacons, and extending the wharfs at the Basin. The first of these, viz., deepening and straightening the canal, is also provided for in the estimate lately sanctioned; and the others are very much to be desired. All of them would be beneficial, and the cost would be small.

28. The lengthening of the canal alluded to in the last para. as having been sanctioned by the Honourable Court, will extend it to Doorgarauzaputam, a place 70 miles north of Madras. But it is earnestly to be hoped that even this is only the commencement of improvement; for the further extension of the canal to the northward will be wonderfully easy and cheap. Colonel Cotton informs us that the high-level channels, in connexion with the Kistnah and Godavery Anicuts, will lie for 240 miles in the exact direction of the Great Northern Road; and he estimates that the cost of these canals, with the additional size necessary to fit them for navigation as well as irrigation, will be no more than *Rs.* 3,000 (or 300 *l.* sterling) a mile. The southernmost point to which these channels will be brought for irrigation only, will be no more than 130 miles from Doorgarauzaputnum, extending throughout along the line of back-waters and low ground which run parallel to the coast, and might be converted into a canal at a small cost; and we cannot believe that, under these circumstances, the Government will fail to take advantage of these singular facilities for securing the vast benefits of an extensive inland canal navigation. We need not repeat what we have already said as to the state of the Northern Road, called a road, indeed, by courtesy only: and to make a tolerable road on that line would cost much more than sufficient to provide the vastly superior convenience of water communication. We may here notice, that if this plan of extending the navigation be adopted, the interference of the Zemindar with the use of the lake will be got rid of, as respects the general trade; for then that of the Northern Districts and of Cuddapah—so far as the bad state of the roads and other communications will admit of the navigation being made available for it—will join by the Northern Canal, and not at Sooloorpett; and the Zemindars will thus have only the produce of their own country to toll, and, indeed, they have really very little more now; because, from the various causes which we have noticed, the lake and canal are but little made use of. But much larger extensions may be effected very cheaply

Appendix (JJ.)

Memoir on Coringa Harbour, by Lieutenant-Colonel *A. T. Cotton*.

I have for several years intended to draw up a full report upon the important harbour of Coringa; but the pressing duties connected with the Godavery Anicut have not left time for it; and as at present there seems little prospect of my being able to do so, I think it necessary at once to write a short memorandum, in order that no further delay may be incurred in bringing the subject before Government. Appendix (JJ.)

The value of the port of Coringa will be understood from the following statement:

1st. It is the only sheltered port where ships can lie in safety at all seasons between Calcutta and Ceylon.

2d. It is situated in a district of the greatest capabilities of any in the Peninsula; for the Delta of the Godavery already contains about 600,000 inhabitants, and is capable of supporting 2,000,000. It consists of 1,200,000 acres of the richest alluvial land, abundantly supplied with water, and is being drained, irrigated and provided with water communications in every direction (there are already 600 miles within the Delta), at a total expense of nearly a quarter million sterling, and produces sugar, tobacco, rice, cotton, hemp, &c. &c., to such

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such an extent as to have an export trade from the coast of more than 14 lacs, which is rapidly increasing; and such a Delta of course gives an immense value to its port.

3d. It is situated at the mouth of the river Godavery, which drains a basin of much more than 100,000 square miles, of which it is the natural commercial outlet. The river has been navigated 450 miles from the sea, goods having been repeatedly sent down by the enterprising house of Palmer of Hydrabad, about the time of their failure. The extensive cotton fields of Berar, with the great commercial city of Chandah, and the important cotton marts of Oomrawattee, Henghun Ghat and Aroee, are situated on or close to this line of navigation; and from the information of a gentleman who has repeatedly navigated this noble river, it appears that only the annoyances of the petty chiefs on its banks, and the want of European enterprise, have hitherto prevented it from becoming the line of a most important trade. The Nagpore cotton alone (amounting to about 20,000 tons, equal in quality to the Mobile cotton), at present conveyed for export by a long, tedious and uncertain land-carriage, either 500 miles to Mirzapore, on the banks of the Ganges, or 400 miles to Bombay, could be conveyed in a tenth of the time, and at a tenth of the cost, to Coringa, by water communication.

4th. On this river, and its tributaries also, are situated vast forests; and coal has been found in three localities, one of the specimens of which appears to be of very fair quality.

5th. This port is about the cheapest in the world, provisions being cheap, and workmen abundant, and the shipping expenses of the harbour not one-tenth of those incurred in running up the Hoogly. There is none where repairs to vessels can be executed at a lower rate; and nothing but want of attention to the port at present prevents the ship-builders from having a patent slip, and everything which could facilitate the execution of repairs.

6th. The business of the port has rapidly increased already, since the Government works for the improvement of the Delta and the sugar manufactories have been commenced.

The port has thus remarkable advantages, and cannot but be worthy of the attention of the Government. The anchorage is in a bay protected by the main land, islands and mud banks from the violence of the sea, and nearly opposite the mouth of the small river Yelairoo, which enters the bay between the two villages of Cocanada and Jagarnaikpoorum. About seven miles from this, at the bottom of the bay, the Yanam branch of the Godavery flows into it, a little below the town of Coringa. The main branch of the Eastern Godavery falls into the bay by several channels between islands and banks on the southern side of the bay, and has at present no channel with more than a few feet at the entrance.

The Coringa River is the one in which the ship-building establishments are situated, and the native vessels are laid up, and where many of the native merchants reside and have their godowns, partly loading their vessels in the river, and filling them up after they have gone out to the bay. Many of the large vessels are also loaded from here, their cargoes being sent from nine to 12 miles to the anchorage in large decked boats.

The Cocanada River has of late become more and more a place for the collection of goods, and the residence of merchants and agents, and being now connected with the main Godavery by a good navigable channel, it will soon be by far the principal place of shipment.

The principal defects of the port are these:

1st. At the head of the bay, and opposite the mouth of the Coringa River, is a bar of sand, on which there is only nine feet of water at high water; but for which the largest vessels could be taken into the Coringa River for repairs, and all the native craft could be fully loaded there, and leave the river ready for sea.

This bar is evidently generally stationary; but in the great flood of 1849 it was raised about two feet. The centre of it is hard sand; and after much examination and consideration, I am satisfied that a good channel could be made through it (and kept open) by the dredge at an inconsiderable expense, probably under *Rs.* 10,000. If the water were deepened only four or five feet, it would be an incalculable improvement to the port; for this bar seems to be the only thing that prevents its becoming one of the best repairing ports in the world, on account of its cheapness.

The Coringa River is very winding, and some bends might be cut away with great advantage and at no great expense. Ultimately, it would be desirable to carry out two lines of loose stone-work from the mouth of the river across the bar and some distance into the bay, in order to confine the current, and cause a scour, which would no doubt secure a fine deep channel sufficient to enable very large vessels to pass in and out loaded. But the deepening of the bar to enable vessels to enter the river empty for repairs, is the great point, and certainly worth a much larger outlay than it will require.

2d. The other great defect is the shallowness of the bar at the mouth of the Cocanada River, which is much more exposed to the swell of the sea than the Coringa River, there being almost always a slight surf beating on this part of the shore of the bay, and on this account the opening for the escape of the water of the river wanders up and down the coast, as is usual in such situations. The direction of the surf being at all seasons from the northward, the opening goes further and further to the south, till the turn opposite to the line of the river is so sharp that, on the occasion of some fresh, it cuts through the neck of sand, and the course is again more direct. Five years ago, this action was assisted by cutting a perfectly direct channel to the sea, which was of great use for a time; but the river having been neglected since, it has of course again wandered to the southward. The bar is always considerably lowered by the freshes; but much more when the course of the river is direct than when it goes far to the southward. When the direct cut was made, a line of stones was laid for a short distance at the mouth, so as to keep off the blow of the

surf

surf from the point where the stream entered the bay: this was also of use at the time, and should have been gradually extended to seaward. The old course of the river was also banked across, in order to keep or direct the stream as much as possible through the new cut; but this was only a slight work, and was carried away by the flood of 1849. In consequence of the order of Government that no work should be done to this important river till a complete report, with estimates, &c., could be sent in, none of the small works by which it might at a most trifling cost have been kept in a very tolerable state of efficiency, have been executed for the last few years; in consequence of which the bar has been this year so high that there was not a foot of water on it at low-water, and the inconvenience to the shipping has been so great as most seriously to interfere with the trade of the port: the loss by detention of some ships, and by the driving away of others to seek cargoes where more attention would be paid to them, having been very great. To prepare a complete project and estimates for the port, was impossible while the engineers were so engaged with the great works in the interior of the district; but had the Collector and Civil Engineer been thought capable of judging of what works could in the meantime be executed to keep the river in a tolerably effective state till the more extensive works could be planned, these evils might easily have been remedied. The same mistake has been made in this case as in a thousand others, by supposing that the waste of public money is chiefly caused by things being imperfectly done; whilst the real fact is, as I have so repeatedly stated, that for one rupee lost by works being done imperfectly, 10 are lost by their not being done at all. While the Public Works Department is kept in such a state of utter inefficiency as it still is, we must be content to do things in a patch-work way, rather than do nothing; for if neither efficient establishments are kept up for the Public Works, nor the local officers allowed to do the best they can in their cramped circumstances, all classes of the community must be sufferers. The mischief that is done to the country by such neglect of an important port is incalculable; for the captain of a vessel goes away in disgust, and reports to a score of others, masters and merchants, that it is hopeless to attempt to get a cargo in a port so neglected; and numbers of vessels are thus prevented from coming there.

What is immediately wanted is, that the old branch of this river should be closed with an embankment, and a direct cut made as often as is necessary, through the sand that forms inside of the new cut, so as to assist the river in keeping a direct course as much as possible. Probably 2,000 or 3,000 rupees a year will be sufficient to do what can be done in this way.

The permanent works required are,—

1st. A lining of loose stones on both sides of the river, extending from a little distance above the bridge to the sea (about a mile), confining the stream, and compelling it to cut at the bottom instead of the sides; this operation has been attended with wonderful success in the Clyde. 2d. The continuation of these lines of stones out into the bay till they reach a considerable depth of water; they might be taken in the first instance into eight or ten feet water, and gradually extended.* Behind this stone-work, within the river, sand or earth should be thrown, to fill up to above the level of the freshes, so as to form a broad clear space in advance of the present buildings on each side of the river; and these wharves should be carefully preserved in the hands of Government, so as to prevent their being in the smallest degree interfered with by individuals. I have no doubt that by these works the mouth of the river might be kept open at all times for large boats; and country vessels might even be brought in and loaded in this river, as well as in that of Coringa.

So anxious are the merchants and shipowners of the port to have something done, that they are quite willing that the port dues, now very light, should be doubled, if the money were laid out on its improvement; and with the port dues at present about 3,500 rupees a year, would thus immediately amount to 7,000 rupees a year, and would rapidly increase with the improvement of the port. If the Government would but sanction the regular appropriation of these dues as a fund to be faithfully reserved for this purpose, the port might in time be made most complete in every way. But it is astonishing that the principle so extensively brought to bear in England should as yet have found no place in this country, viz., that where an annual income is secure, the principal of which that income is the interest, should be considered available. Almost all the harbour-works in England have been executed by money raised in this way; and if Government would allow money to be raised on the security of the port dues of Coringa, an abundant supply might at once be obtained to carry out for the improvement of the port a complete set of works corresponding to those now under execution in the Delta. Government might double the port dues, and then offer interest of 6 per cent. on a lac of rupees, taking the port dues as their security; and there could be no sort of risk in such a transaction; all parties would be gainers and none losers by it. It is astonishing how we as yet throw away the immense opportunities we have, and this is one of the main causes why the country continues in such a torpid stagnant state. There is no want of money, or of anything else, to prevent our carrying out universally those improvements which are essential to the prosperity of the country; for the money now lost in the ports annually from their wretched state, is equal to the interest of 10 times the capital that would be required to put them in a state of efficiency. A lac of rupees would probably do almost all that the port of Coringa at present requires, and if it were much improved,

* They would be formed on such a line as would be best calculated to lead the sand past the mouth of the river, and so keep the bar as low as possible, according to the known principles on which such works are constructed.

Appendix (JJ.)

improved, the increase of the dues would be so great as soon to provide another lac of rupees if wanted; and thus it would not be necessary for Government to pay a single rupee. I should mention here, that it would be very desirable to remove the light-house from its present site on Hope Island, to about five miles to the north point of the mud banks; because since the light-house was built, the islands and banks have extended so far to the northward, that a vessel does not see it till she is near the entrance of the bay; and if rebuilt there (probably on a foundation of screw piles) it would be far more useful than in its present position. This should be included in the set of works for the improvement of the port. I should also mention that the new Godavery works will secure a constant scour to the Cocanada River, by throwing a part of the Godavery water through it, the whole year round.

The following is a rough estimate of the works most urgently required :—

	Rs.	*a.*	*p.*
Cutting through the Coringa bar, 50,000 C. yards of sand at 3 annas	9,375	–	–
Cutting, and bank to the Cocanada River	2,000	–	–
5,000 tons of stone for the mouth of ditto, at 12 annas	3,750	–	–
Sundries, including superintendence	3,000	–	–
	Rs. 18,125	–	–

The further works I should recommend are :—

Lining the Cocanada River, 40,000 tons of stones, at ½ rupee	20,000	–	–
Filling in behind the stones 20,000 C. yards of sand, at 1 anna	1,250	–	–
Extending the stone-work into the bay, 20,000 tons, at 10 annas	12,500	–	–
Cutting bends in Coringa River, 400,000 C. yards of earth, at 1 anna	25,000	–	–
Carrying stone-work on each side of the stream, across the bar, 80,000 tons, at 6 annas	30,000	–	–
New Lighthouse	10,000	–	–
Superintendence and sundries	10,000	–	–
	1,08,750	–	–
To which adding 1st Estimate	18,125	–	–
TOTAL	*Rs.* 1,26,875	–	–

The increase of the trade of Coringa has been very great of late; for the exports which a few years ago amounted to only 3 lacs, have lately increased to nearly 14 lacs. The sugar, tobacco, hemp, oilseeds, &c., are entirely new exports, and, with the grain to Mauritius and Bourbon, form a solid foreign trade, free from the great irregularities and uncertainties of a mere home grain trade. A very intelligent supercargo, who had had much experience in commerce, told me that it was the cheapest port in the world; and that as its advantages become more known, the resort of vessels to it would rapidly increase, particularly if by removing the bar its convenience for repairs could be made equal to its cheapness. And I trust that Coringa, as the port of one of the finest tracts of this country, on which Government have thought it worth while to spend nearly a quarter of a million sterling, and situated as it is, at the mouth of a first-class river leading direct to one of the best cotton districts of India, will at length receive that attention which it will so abundantly repay. If it should be said that nobody can be spared to superintend the works, I answer that this also is simply a question of money; if the Civil Engineer be authorised to get the work done, he will find no difficulty in obtaining the superintendence required.

The foreign trade will be seen by the accompanying statement to be very considerable, and in a little more than eight months of the current year, the arrivals exceeded the whole of those of last year. As the new irrigation works approach to completion, if any kind of attention is paid to the port, we may confidently expect a very great increase of trade; and the opening of the navigation of the Godavery to what is acknowledged to be the best cotton tract in India, would immediately make it one of our most important ports.

Madras,
15 September 1852.

(signed) *A. T. Cotton*, Lieut.-Col.,
Chief Engineer.

STATEMENT,

Appendix (JJ)

STATEMENT, showing the IMPORT and EXPORT DUES collected in the District of *Rajahmundry*, for the last Ten Years.

YEARS	Imports.	Exports.	TOTAL.	Deduct Charges.	Net Collection.
	C. Rs.	*C. Rs.*	*C. Rs.*	*C. Rs.*	*C. Rs.*
1842-43 - -	4,297	10,737	15,034	3,916	11,118
1843-44 - -	15,648	4,840	20,488	3,916	16,572
1844-45 - -	11,074	22,927	34,000	3,907	30,093
1845-46 - -	15,035	38,606	53,641	3,909	49,732
1846-47 - -	9,851	44,956	54,807	3,887	50,920
1847-48 - -	21,687	42,592	64,280	3,917	60,362
1848-49 - -	14,106	21,679	35,785	3,646	32,139
1849-50 - -	11,666	21,300	32,966	3,673	29,293
1850-51 - -	8,686	29,166	37,853	3,919	33,934
1851-52 - -	3,088	31,538	34,626	3,922	30,704

The falling-off in receipts after the year 1847-48 was caused by the abolition of the duties between port and port, which took effect in the following year. It will be seen by this and the following Table, that the exports exhibit a material and progressive increase subsequently; the greater part of which is in the shipment of oil, seeds and grain to Great Britain and France; being an entirely new branch of trade.

ABSTRACT STATEMENT of Value of EXPORTS by Sea, in the *Rajahmundry* District, for Ten Years, or from 1841-42 to 1850-51.

YEARS	EXPORTS.		
	Grain.	Other Things.	TOTAL.
1841-42 - -	23,040	4,36,322	4,59,362
1842-43 - -	87,112	4,77,263	5,64,375
1843-44 - -	1,29,197	5,04,794	6,33,991
1844-45 - -	1,92,426	5,36,861	7,29,287
1845-46 - -	3,62,177	5,44,377	9,06,554
1846-47 - -	3,84,296	9,69,207	13,53,503
1847-48 - -	2,56,031	8,39,366	10,95,395
1848-49 - -	2,22,500	8,34,227	10,56,727
1849-50 - -	1,02,041	8,74,678	9,76,719
1850-51 - -	2,81,335	10,23,303	13,04,638

A STATEMENT, showing the Total Amount of SHIPPING, British and Foreign, arriving at and departing from the Port of *Coringa*, in each Month of the following Years.

MONTH.	1850.								1851.								1852.							
	BRITISH.				FOREIGN.				BRITISH.				FOREIGN.				BRITISH.				FOREIGN.			
	Arrivals.		Departures.		Arrivals.		Departures.		Arrivals.		Departures.		Arrivals.		Departures.		Arrivals.		Departures.		Arrivals.		Departures.	
	Number.	Tonnage.	Number.	Tonnage.	Number.	Tonnage.	Number.	Tonnage.	Number.	Tonnage.	Number.	Tonnage.	Number.	Tonnage.	Number.	Tonnage.	Number.	Tonnage.	Number.	Tonnage.	Number.	Tonnage.	Number.	Tonnage.
		Tons.		*Tons.*		*Tons.*		*Tons.*		*Tons.*		*Tons.*		*Tons.*		*Tons.*		*Tons.*		*Tons.*		*Tons.*		*Tons.*
January -	1	258	4	804	–	–	–	–	3	758	6	1,347	3	909	5	1,540	4	1,879	5	2,288	5	1,588	1	344
February -	6	1,787	3	762	4	1,683	3	1,183	2	452	6	1,358	2	656	3	870	5	1,105	5	917	4	1,137	6	1,946
March -	8	2,515	8	3,110	–	–	1	500	7	2,926	4	1,359	3	873	4	1,240	2	863	1	62	2	494	3	791
April - -	9	2,298	9	2,350	–	–	–	–	8	1,522	7	2,224	2	520	1	269	6	1,225	4	1,007	3	913	5	1,408
May - -	6	910	6	1,163	2	431	1	160	5	1,299	7	1,657	2	505	–	–	10	2,341	6	1,561	2	707	4	1,228
June - -	6	1,530	9	2,137	3	818	3	705	6	3,045	4	1,473	1	358	2	515	6	2,655	6	1,973	1	296	1	337
July - -	5	1,768	2	565	4	1,199	1	384	1	159	5	2,305	6	1,856	3	884	6	2,263	8	2,184	4	1,203	4	1,204
August -	3	921	6	1,589	4	1,020	5	1,450	9	2,440	10	2,620	3	1,008	5	1,650	10	3,481	6	1,835	8	2,475	4	1,165
September	4	806	6	1,689	4	959	6	1,511	5	2,369	8	2,277	2	618	3	1,002	2	978	11	3,593	2	482	3	960
October -	6	1,685	2	746	5	1,486	1	218	3	1,363	2	823	5	1,230	1	207	–	—	–	—	–	—	–	—
November	2	247	3	428	3	967	1	255	–	–	1	420	–	–	2	474	–	—	–	—	–	—	–	—
December	3	960	2	630	3	816	5	1,515	2	379	2	873	1	334	1	271	–	—	–	—	–	—	–	—
TOTAL -	59	15,685	60	15,973	32	9,379	27	7,881	51	16,712	62	18,716	30	8,877	30	8,922	51	16,790	52	15,420	31	9,695	31	9,383

British and Foreign Arrivals, Grand Total, 1850 - - - - - 25,064
Ditto - - - - - 1851 - - - - - 25,589
Ditto - - - - - 1852 - - - - - 26,485

Coringa Sea Custom Dues and consolidated Port Dues are only computed up to the 1st of May; and those of Cocanada up to the 1st of September of 1852.

N. B.—Native vessels' Port Dues and Sea Custom Duty are included in the above Statement.

Appendix (KK.)

LETTER from the Chairman of the Madras Chamber of Commerce to the Secretary to the Board of Revenue, on the Subject of the projected Survey of the Godavery River, dated 4th March 1852.

ON the 22d September last you did the Committee of the Chamber of Commerce the favour, under the authority of Government, to place in their possession copies of all the official correspondence and reports relative to the projected survey of the Godavery River, and I have now the honour, by their desire, to request the attention of the Board of Revenue again to the subject, and to submit the following observations, in the hope that the Board may be induced to move the Government to obtain from the Government of India a reconsideration of the question of sanctioning the required outlay for the object that was held in view.

The Committee of the Chamber of Commerce consider that too great importance cannot be attached to the end that the projected survey is destined to lead to, viz., that of opening out the navigation of the Godavery River for purposes of traffic; but they purpose confining their present observations to its effect upon the intercourse between Berar and Nagpore and the Eastern Coast.

From its leading importance, in a general point of view, the Committee would first speak of cotton as one exportable product of the countries named. The reports forwarded by Mr. Commissioner Elliot will have made familiar to the Government both that the growth of this article in the valley of Berar is of great extent, and that the only present means of conveying it to a shipping port are defective, while at the same time costly to the last degree.

In respect of the extent of cotton exported, Mr. Elliot, in his letter of 31st October 1850, estimates it at 1½ lacs of loads, or 50,000 candies (this at 252 lbs. per load should be 75,600 candies). Mr. Chapman, in his work on the Cotton and Commerce of India, quotes the average of nine years' importation into Bombay from Berar, *viâ* the Concan, viz., from 1836 to 1845, as 34,750,000 lbs. (equal to a fraction under 70,000 candies;) and the Bombay Trade Report for 1849–50 gives the value of the same import for that year as *Rs.* 32,70,000. The importance of the actual trade in this article from Berar may therefore be considered as established. Taken at 70,000 candies, it exceeds by 17,000 candies the average export by sea of the whole Madras territories for the three years ending with 1849–50, and fills between 25,000 and 30,000 tons of ship-room in its conveyance.*

	Candies.
1847–48 -	49,000
1848–49 -	36,000
1849–50 -	75,000
	3)1,60,000
	53,333

The same letter of Mr. Elliot, above quoted, sets out the extraordinary difficulties amidst which this valuable traffic is now conducted, and which is amply confirmed from other sources. The only present outlet for this trade is Bombay, the journey to which sometimes occupies 60 days; the only mode of carriage is on bullocks, which must obviously expose the article to such variety and extent of damage as seriously to deteriorate its value before reaching its destination; and, besides the injury thus received, loss in quantity occurs from thefts and destruction by other causes.

Upon the question of the expense of transporting the cotton of Berar to Bombay, the reports forwarded do not admit of an exact calculation. Captain Fenwick's first letters speak of varying rates of cost; and Lieutenant-Colonel Cotton, in his letter of 10th July 1851, quotes, on the same gentleman's authority, *Rs.* 6 per load of 250 lbs., as hire actually paid for a distance of 320 miles. Mr. Chapman, in his work before alluded to, gives 0·71 pence per lb. as the cost of conveyance between Berar and Bombay, which is equal to *Rs.* 7. 6. a load. *Rs.* 7 per load, or 0·67 pence per lb., may therefore be taken as the rate of transport on the other side, for the purpose of making the contrast with the opportunities that would be presented by the opening up of the Godavery for water communication with a shipping port.

Captain Fenwick estimates *Rs.* 150 as the cost of conveyance from Woonee to Coringa, 427 miles, in a boat containing 50 loads, which is equal to 0·29 pence per lb. Lieutenant-Colonel Cotton, in his letter of 10th February 1851, gives *Rs.* 22 a ton (= 0·24 pence per lb.) as the computed cost for 320 miles. This would make 0·32 pence per lb. for 427 miles. But these estimates allow for no return traffic, and calculate on the boats being destroyed on delivering their freights of cotton, and batta being paid to the boatman for a march back to the point of departure. With, however, a traffic once fairly established on the Godavery, such a sacrifice as this need not be entailed, and one-third may safely be deducted from the above estimates, leaving thus the cost of carriage at a computed amount of 0·20 pence per lb.

That this computation of the cost of transit is over rather than under estimated, may be reasonably inferred from an examination of the rates fixed by the Government of India for the transport of merchandise by the steamers on the Indus. According to the published table, goods exceeding 29 lbs. per cubic foot in weight may be taken from Kurrachee to Larkana, 450 miles, for *Rs.* 1. 6. per maund of 80 lbs., and down the river for one-third, or

As.

* The original letter states it at between 2,500 and 3,000 tons; but this being clearly a mistake, a reference was made to the Chamber of Commerce by the Public Works Commissioners, and it was found that a cipher had been inadvertently omitted from both amounts.

Appendix (KK.)

As. 7. 4. This latter is equal to 0·14 penny per lb., and though unscrewed cotton is of course of much greater bulk than what is above indicated, the circumstance that this is the rate for the costly conveyance by a steamer, leaves it a fair matter for comparison.

The saving, then, by the adoption of the Godavery route for the cotton of Berar would appear to be as follows:—

Cost of conveyance to Bombay - - - - - -	0·67
Ditto - - - Coringa - - - - - -	0·20
Difference pence per lb. - - -	0·47

But this important saving on an article of such small cost is far from being the only advantage that the opening out of the Godavery route would confer. The economy of time would also be most considerable, for the voyage down the river might be completed in from 10 to 12 days; besides that what now appears not unfrequently to happen would be altogether avoided; that is, a loss of a season in the export of cotton, by the monsoon frequently overtaking it in its transit. And to this may be further added, an escape from all that injury to the article which is an inevitable consequence of its being carried on the backs of bullocks, and which so seriously detracts from its value in the home market.

From the foregoing observations it will be seen that in respect of the important article of cotton alone, it being one, moreover, which engages the especial attention of the Government, and of the mercantile and manufacturing communities at home, any measure which contributed to render the Godavery River navigable for purposes of traffic would realise these beneficial results:

1st. One hundred and twenty thousand bales of cotton would, so to speak, be secured for export from this country in a sound merchantable condition, and fit for the use of the manufacturers in England.

2d. An economy in the cost of transport of this from the place of production to a port of shipment would be effected to the extent of 70,000 *l.*, to which may be added,—

3d. That from the foregoing advantages and facilities there would flow a very extended cultivation of the article, which, according to every report, is now checked by the difficulties that attend the produce being brought to market.

Cotton wool, however, forms only an item (though a very considerable one) in the general trade that is conducted with Bombay *viâ* the Concan. The following abstract table from the Trade Reports of 1849–50 will show the great extent of this traffic, the articles composing which can only be transported by the same rude means, and under the same impediments, as the cotton of Berar.

PRINCIPAL IMPORTS into *Bombay, viâ* the *Concan*.

	Rs.		*Rs.*
Molasses or Jagree - - -	2,00,000	Chunam - - - -	1,90,000
Gingelly oil - - - -	1,35,000	Cotton Wool - - -	32,70,000
Linseed - - - - -	1,50,000	Ghee - - - - -	6,30,000
Gingelly seed - - - -	2,00,000	Batty - - - - -	4,32,000
Arrack - - - - -	2,00,000	Bagree - - - - -	1,18,000
Turmeric - - - - -	1,19,000	Gram - - - - -	2,40,000
Hemp - - - - -	2,40,000		
Wheat - - - - -	4,40,000		*Rs.* 74,64,000
Rice - - - - -	9,00,000		

PRINCIPAL EXPORTS from *Bombay* to the *Concan*.

	Rs.		*Rs.*
British Piece Goods - -	19,00,000	Woollen broad-cloth - -	1,00,000
Twist and yarn - - -	5,00,000	Dates - - - - -	3,20,000
Raw silk - - - - -	9,60,000	Sugar - - - - -	1,20,000
Wines and spirits - - -	2,90,000	Hardware, cutlery, &c. -	17,00,000
Malt liquors - - - -	1,30,000		
Metals - - - - -	10,00,000		*Rs.* 74,55,000
Cocoa-nuts - - - -	1,25,000		
Cocoa-kernels - - - -	3,10,000		

The tonnage of this entire traffic cannot be ascertained, but Mr. Chapman, in his work before alluded to, estimates that of the whole trade with Bombay through the Concan at ten times the tonnage of the cotton, or 180,000 tons. The saving in the item of carriage at the rate of a halfpenny per lb. upon such portion of this as might be diverted into the Godavery route, would swell the 70,000 *l.* effected on the article of cotton to an incalculable amount.

The Committee of the Chamber of Commerce indulge the hope that a consideration of the foregoing remarks may weigh with the Board of Revenue in inducing it again to solicit the attention of Government to the question of a preliminary survey of the Godavery River. But they cannot avoid observing, in conclusion, how much it becomes additionally pressed upon the attention of the authorities, in the feature imparted to it in the letter of Mr. Collector Prendergast, who has pointed out the important advantages to be reaped to the State, and imparted to the people of Hyderabad, by the establishment of a salt depôt 200 miles up the river. Looking at the nature of the country traversed at present within those 200 miles by

by the salt-laden bullocks, it will be evident that the cost of transporting the article into the interior must be gravely enhanced, and, in that fact, the consumption be interfered with, with its consequent detriment to the Government finances. Whereas, with a great local depôt at the site proposed, there cannot be a question that, with the avoidance of the delay, difficulties and expense that are now encountered, the sale of salt to the people of Hyderabad and Nagpore would be vastly increased, and the consumption in those countries bear a nearer approach to the general average than it now does, as shown by the Madras Trade Reports for 1849–50, where the total export by land from Rajamundry, Masulipatam and Guntoor, was but 373,797 cwt., or between 3½ and 4 lbs. per head of the population.

Appendix (K K.)

From	*Cwt.*
Rajamundry	10,823
Masulipatam	152,484
Guntoor -	210,493
	373,797

(signed) *Jas. Ouchterlony,*
Chairman.

Appendix (L L.)

LIST of the Works executed out of the Four Lacs a Year granted for the Trunk Roads.

First.—Roads Constructed or Repaired by the direct Agency of the Road Department.

Description of the Roads.	Length in Miles.	Sums spent from December 1845 to May 1851.	REMARKS.
		Rs.	
No. 1. The Great Western Road from Madras to Vaniembaddy.	121	3,71,212	This road, 121 miles in length, has been constantly improving under the disadvantages of a badly-selected line, imperfect surface and drainage, and a traffic such as no other road in India is subjected to. The cost of carriage has been reduced one-third since the Road Department was formed, and though the surface is not in a condition altogether suitable for fast travelling, it admits of posting at the rate of six miles an hour. The sum spent has been 47 *l.* 4 *s.* a mile yearly, including the cost of a number of bridges of different sizes.
From Vaniembaddy to Neykoondy, on the borders of Mysore.	4	6,383	This sum has been spent in repairing or improving four miles of the continuation of this line.
No. 2. Road from the western borders of Mysore, by the Sumpajee Ghaut, to Mangalore.	105	21,877	This road was in tolerable order through Canara, but in a very incomplete state through Coorg, when the department was formed; but a considerable amount of work has been done upon it in Coorg, and a bridge of one arch, 42 feet span, has been built; and for the last four years it has been kept in excellent order through Canara, and in fair order through Coorg. The Collector of Canara speaks in high praise of this road in his reports for 1850 and 1851. Another bridge of one arch, 45 feet span, has been about half built. Length, in Coorg 35 miles, in Canara 70 miles; total, 105 miles.
No. 4. The road from the borders of Mysore, by the Perumbuddy Ghaut, to Cannanore.	68	1,83,135	This is a new work from end to end, and includes the Perumbuddy pass, which ascends 3,000 feet. The whole line, 68 miles in length, is through a most difficult mountainous country, the greater part of which is under dense jungle. The whole line has been under-drained, and all the rivers bridged except one.
Ditto - - - - - - -		2,000	This sum was spent on the same line in keeping the roadway passable for cattle while the work was in progress.
No. 5. From Walliaur to Ponnany.	71	27,572	This road has been greatly improved, and has been maintained against a very heavy cart traffic for three years.
Another portion of No. 5 extends from Coimbatore to Walliaur.	16	28,478	This is an entirely new line of road, and some part of it through a very difficult country.
The road from Vaniembaddy, through the Salem district, to the borders of Coimbatore.	112	5,600	This line has been kept up in a great measure by the cart-tax of the Salem district, but the small sum here set down has been spent on it from the "Four-lac Fund."
A portion of No. 6. Road from Goomidapoondy to Nellore.	84	39,783	This sum has been chiefly spent between Goomidapoondy and Nellore, and that part of the road only has been completed and kept in order.
On the same line, between Madras and Goomidapoondy.	27	15,149	Repairs of earth-work have been done; but the estimate for metalling and bridging the streams not having been sanctioned till 20th May 1851, the work is incomplete, and of little value to the traffic, which is in consequence very trifling.
From Itchapoor to the frontier of Bengal.	54	15,319	Some portion of this has been repaired, and all that has been completed has been kept in order, but the line is very incomplete.

(*continued*)

First.—Roads Constructed or Repaired by the direct Agency of the Road Department—*continued.*

Description of the Roads.	Length in Miles.	Sums spent from December 1845 to May 1851.	REMARKS.
		Rs.	
No. 8. Road from Palaveram to Vicravandy, on the road from Madras to Trichinopoly.	55	2,21,721	From Chingleput to Vicravandy, 55 miles; the road has been newly made with the greatest care, and is in the highest order for travelling. The charge includes the cost of 24 bridges, from 12 to 36 feet span, and 36 smaller tunnels.
From Vicravandy to Oolandoor-pett, on the same line.	30	46,000	This road has been re-formed, and is nearly completed; length, 30 miles.
No. 9. From the Lower Coleroon Anicut to Combaconum.	14	16,017	The principal work done on this line has been from the south bank of the Coleroon to Combaconum, under the management of the Civil Engineer's Department.
No. 10. Road from Arcot to Yellapilly.	65	54,330	This line is well advanced, and it is expected that it will be open for carriages in a few months.
Nos. 11 and 12. Goolcherroo Ghaut and Road.	18	21,952	Opening the Goolcherroo Road and Ghaut from No. 1 Road towards Cuddapah, and rendering it fit for wheel carriages. This is a mountain road, through very difficult country.

Second.—Large Bridges built by the Civil Engineer's Department, but paid for out of the "Four-lac Fund."

Description of the Bridges.	Sums spent.	REMARKS.
	Rs.	
Naragumpilly Bridge, on the road from Walliaur to Paulghaut.	5,903	This bridge has five arches, of 39 feet each; the entire span between abutments being 214½ feet.
Rebuilding a bridge over the Cauvery at Bowany.	35,900	A bridge building at the cost of the Pagoda Fund, having been destroyed by an unseasonable flood in the river, which occurred when the work was on the point of completion, a new bridge was erected with money supplied from the Road Fund. This fine structure is in part founded on the solid rock, and in part of very large rubble stones, filled in upon the rock below the low-water level. It consists of 26 arches of 47½ feet span each; the whole breadth spanned being more than a quarter of a mile (1,385 feet). The parapet walls are now building, and the work, which has already been in use for some months, will be completed for the sum of 38,942. 10., or *Rs.* 27. 5 annas (2 *l.* 14 *s.*) for each foot in length of the bridge.
Completing the construction of a bridge over the Cauvery at Trichinopoly.	27,665	A bridge over the Cauvery at Trichinopoly was in progress when the same flood which destroyed the work at Bowany, carried away several arches. The work has been completed from the Road Fund, and has been some time in use. This magnificent work is founded on wells in pure sand, no solid earth or rock having been met with in the entire length. It consists of 32 arches, of 45 feet each, and spans a total breadth of more than one-third of a mile (1,714 feet). The whole cost, including losses, has been *Rs.* 98,640. 6. 6. (about 9,800 *l.*), or 5 *l.* 10 *s.* the running foot of bridge.
Bridge on the Coleroon River, on the road from Madras to Trichinopoly.	1,22,288	This is a similar structure, but on a still larger scale. It is now building, and it estimates the cost a further sum of *Rs.* 44,160. A considerable loss was sustained by a flood in this river also when the work was far advanced. The cost of the work up to this time, including all losses, is at about the same rate as that last-mentioned. The work is to consist of 38 arches, of 60 feet span each; the piers founded on wells, and the whole span nearly half a mile, 2,557½ feet between the abutments; including the wing walls, the total length is 889 yards. If this work is completed for the sum estimated, it will cost about 14,600 *l.*, or 5 *l.* 12 *s.* a running foot. The breadth of roadway in all these bridges is 26 feet.
A bridge along the anicut across the Vellaur River, on the road from Madras to Combaconum.	18,480	19 arches of 31 feet span; breadth spanned between abutments, 674½ feet, or including wings, 866½ feet.

A GLOSSARY

A GLOSSARY OF THE INDIAN TERMS OCCURRING IN THE REPORT AND APPENDIX.

Abkarry - - - - - The revenue derived from the monopoly of the sale of spirituous and fermented liquors.

Amauny - - - - - A term used to designate direct administration or management by the officers of the Government, as distinguished from that by contract, lease or other intermediate agency.

Ameen - - - - - - A subordinate officer in the Revenue or Police Department.

Anna - - - - - - A small denomination of money; being the 16th part of a rupee. Also the 16th part of anything.

Anicut - - - - - - A weir or dam of masonry across a river.

Ayacut - - - - - This term signifies the whole taxable area in a village, or under an irrigation work.

Bandy - - - - - - A wheel conveyance; most commonly used in the limited sense of a bullock cart.

Budgerow - - - - A river passenger boat, with a raised cabin.

Bund - - - - - - The retaining bank of a tank. A river embankment. A bank generally.

Calingulah - - - A masonry work in the bank of a tank or channel, for the discharge of surplus water.

Calwah - - - - - A channel.

Candy - - - - - - A denomination of weight. The Madras Candy is 500 pounds avoirdupois; the Bombay Candy is 784 pounds.

Carkoon - - - - A subordinate officer under the Tahsildar; the same as a Turrufdar.

Carnatic - - - - The plain country on the eastern side of the Indian Peninsula, between the Central Mountains and Table Land, and the Bay of Bengal. To the north it is bounded by the Northern Circars.

Cavulgar - - - - A watchman; commonly used of the village watchman.

Cawny - - - - - - A land measure. It contains 6,400 square yards; being within a fraction one English acre and one-third.

Chit - - - - - - - A small piece of written paper or Palmira leaf, as a memorandum or receipt.

Choultry - - - - A public shelter or lodging for native travellers.

Cholum - - - - - A species of grain.

Chunam - - - - - Lime; also mortar.

Circar - - - - - - The Government.

Conocapillay - - - An Accountant; not applied to mere office accountants, but to men having some charge or duty involving the keeping of accounts.

Cooly - - - - - - A labourer who works for daily hire; or a man who does single jobs for hire.

Cotay - - - - - - A depôt for the sale of salt.

Cullum - - - - - A nominal measure of grain. At Madras, it is equal to about three bushels, but varies in different places.

Cumbly - - - - - A thin and coarse blanket; made of the wool of Indian sheep.

Curnum - - - - - A village accountant.

Curry Stuff - - - The mixture of spices used by the natives of India to flavour their staple food, boiled rice.

Cusbah - - - - - The chief town of a District or Talook.

Cutcherry - - - - The office of a Collector, a Tahsildar, or other Revenue Officer.

Cutwall - - - - The head police officer in a town or cantonment. He has no judicial functions; being charged merely with the prevention of offences and the apprehension of criminals.

Dhoney - - - - An inferior sort of coasting craft employed on the Coromandel coast. It is of bad form and awkward rig, and is little seaworthy. The dhoney is going out of use, being superseded by the brig.

Dufterbund - - - An office porter; employed to carry about papers and records where wanted within the office building; and occasionally to look for papers wanted, and to put them in their proper places when done with.

Enam - - - - - Land held free, or partially free, of Government tax.

Fusly - - - - - The revenue year; it begins on the 12th July. Fusly 1263 began on the 12th July 1852.

Garce - - - - - A nominal measure for grain and salt. It contains 400 Madras mercals, being equal to 185·2 cubic feet, or a fraction more than 18 quarters English.

Ghaut - - - - - A mountain pass. "The Western Ghauts" is used to signify the range of heights bounding the central table land of the Indian Peninsula to the westward, where it sinks down into the plain: and the term "Eastern Ghauts" is in like manner applied to the less abrupt declivities of the same tract on its eastern side.

Ghee - - - - - Butter prepared by boiling; an article very much used in Indian native cookery.

Godown - - - - A store-house; also an out-house.

Gomastah - - - - An agent for the transaction of business: also (in official use) an accountant or writer in a native language. In this report it chiefly occurs in the latter sense.

Gunny - - - - - A very coarse kind of sacking.

Hungamy - - - - Temporary; applied to servants entertained for temporary purposes.

Jaggry - - - - Coarse sugar before the separation of the molasses.

Jagheer - - - - A portion of territory, from a few villages to an extensive tract, conferred by the Supreme Power in the State on an individual. Such a grant confers on the grantee all the fiscal interests of the Government in the tract granted; originally Jagheers were usually granted as a reward for military service.

Jagheerdar - - - The holder of a Jagheer.

Jatra - - - - - A religious fair.

Jelly - - - - - Properly Jully, from a Tamil word. Bricks or stone broken small, or small stones of uniform size. Used in the Road Department, to signify gravel as distinguished from "metal."

Jellied - - - - - (From the foregoing) gravelled—used in the Road Department.

Jummahbundy - - The annual settlement of the land revenue made under the Ryotwar system.

Khoonds - - - - A wild people inhabiting the hill country west of Ganjam.

Kist - - - - - An instalment of the Government tax or rent. All branches of revenue are divided into certain portions, payable at fixed times of the year.

Krore - - - - - One hundred lacks, or ten millions.

Kunker - - - - Nodulous limestone. It forms a very convenient as well as serviceable material for road making; and in the north of India, where it is very common, it is largely used for that purpose.

Kusser - - - - - An extra tax levied on Poonja land, when irrigated from a Government tank or channel.

Lack - - - - - One hundred thousand.

Maliash

Maliahs - - - - A hill tribe in Ganjam.

Mamool - - - - Custom, usage.

Mango tope - - - A plantation or orchard of mango trees.

Maramut - - - - Strictly, repairs. The whole department of Public Works under the Board of Revenue, is styled the "Maramut Department;" and the term "Maramut" is applied to all the work which engages that Department.

Maistry - - - - A master workman in any trade; more particularly a head bricklayer, carpenter, stonemason, &c. In the Public Works Department, a subordinate officer employed to superintend building, &c.

Masula boat - - - The surf-boat used at Madras and on the Coromandel Coast.

Maund - - - - A measure of weight. It varies much in size from place to place, and even at the same place in different trades. The Madras standard maund is 25 pounds; the "Indian maund," used in the Salt Department, is 80 pounds; the Bengal maund is 82$\frac{2}{7}$ pounds.

Meerasy - - - - A proprietary interest or estate in the soil, of a particular kind. Also the title to certain hereditary offices or emoluments.

Meerasdar - - - A holder of land or office on such tenure.

Mogany - - - - A division of a Talook.

Momaty - - - - The Indian substitute for the spade or shovel. In its general form it resembles a hoe, but with a large and strong blade, and a handle not exceeding 18 or 20 inches in length.

Monigar - - - - The head revenue officer of a village. A tank or channel Monigar is an officer charged with the custody of an important tank or channel.

Moochy - - - - An office servant employed to rule paper, bind books, mend pens, make ink, &c.

Moonshy - - - - A teacher of a native language; also a native Secretary or Jawabnavees.

Moonsiff - - - - The head police officer of a village, having also a small penal jurisdiction.

Mottah - - - - A few villages held on Zemindary tenure; a small zemindary.

Moottahdar - - - The holder of such a property.

Moplah - - - - A tribe on the Malabar Coast, descended from Arab settlers.

Moturfah - - - - Special taxes on those who follow manufactures and trades.

Nabob - - - - - A Viceroy. The Mussulman ruler of the Carnatic was so styled, as the Deputy of the Nizam or Soobadar of the Deccan.

Neerany Monigar - A subordinate functionary, charged with the distribution of the water of a large tank or channel.

Nizam - - - - The ruler of the Hydrabad country is commonly so styled; his title being Nizam-ool-Moolk, or Regulator of the Empire.

Nuddee - - - - A river or large watercourse.

Nullah - - - - A small river; also an artificial watercourse.

Nunjah - - - - Land irrigated, or capable of irrigation.

Pattimar - - - - A species of coasting craft employed on the Malabar Coast; it is superior to the dhoney both in seaworthiness and in sailing qualities.

Peishcar - - - - A revenue officer; subordinate to the Tahsildar, but of higher rank than the Turrufdar.

Peishcush - - - - Tribute. The revenue payable by the larger Zemindaries is called by this term.

Poolbundy - - - The term applied to the repair and maintenance of river embankments in Bengal.

Poonjah - - - - Land cultivated without irrigation; also land classed as such in the revenue accounts.

Rajah - - - - - A King or Chieftain. Extensive Zemindars assume the title.

Roossoom - - - - Customary fees or perquisites to village servants and others.

Rowannah - - - A permit or pass for goods having paid duty.

Ryot - - - - - An occupier and cultivator of land.

Ryotwar - - - - The term used for that system of land revenue administration under which the Government officer deals with each Ryot.

Saderwarid - - - The office expenses for stationery, &c.

Sayer - - - - - Transit duties or land customs.

Serishtadar - - - The head native officer of a Collector's office; also the officer in a Talook next under a Tahsildar. The Serishtadar's business is chiefly with accounts.

Sibbendy - - - - A term applied to an establishment of Peons; and sometimes more largely to all classes of Talook or district servants.

Shavy - - - - - Rice crops withered for want of water; sometimes applied also to dry crops withered from failure of rain.

Shroff - - - - - An examiner and sorter of coins in a treasury.

Sudr Ameen - - - A subordinate native judicial officer.

Sudr Adaulut - - - The highest Company's Court at Madras.

Sunnud - - - - An order; a permit; a grant.

Tahsildar - - - - The native revenue officer in charge of a Talook.

Talook - - - - A sub-division of a district or collectorate.

Tappal - - - - - The mail or post.

Toty - - - - - An inferior village servant, who assists the Cauvulgar or Taliary.

Turrufdar - - - - An officer under a Tahsildar, in charge of a sub-division of a Talook; a Carkoon.

Valie - - - - - The standard land measure used in Tanjore; it contains exactly five cawnies, or about 6$\frac{3}{5}$ acres.

Voykal - - - - A channel or watercourse.

Wudder bandy - - A kind of bullock-cart used by the tribe called Wudders; it is of excessively rude construction, and has low wheels rudely cut out of a solid plank of wood, with axles of the same material.

Yairy - - - - - An irrigation tank or reservoir.

Zemindar - - - - One who holds a tract of country, and levies all the Government revenues therein for his own benefit, paying a certain fixed amount annually to the Government.

Zemindary - - - A tract of country so held by a Zemindar.

Zillah - - - - - A division or part. A district or collectorate, as being a division or portion of the Empire.

Zillakdar - - - - A subordinate revenue officer under the Tahsildar, who has charge, under him, of a "division" or "portion" of the Talook. This term, "Turrufdar," and "Carkoon," are applied, in different districts, to the same class of officers.

MINUTES of MEMBERS of GOVERNMENT, and ORDERS or DESPATCHES of the COURT of DIRECTORS.

PUBLIC WORKS DEPARTMENT.

(No. 1, of 1853.)

From Sir *H. C. Montgomery*, Bart., Chief Secretary to Government, Fort St. George, to *James Cosmo Melvill*, Esq., Secretary at the India House, 13 April 1853.

Sir,

I AM directed by the Right honourable the Governor in Council to forward, for the purpose of being laid before the Honourable Court of Directors, five printed copies of the First Report furnished by the Commissioners appointed to inquire into, and report upon, the Department of Public Works, together with a transcript of a letter addressed on the subject to the Government of India.

I have, &c.
(signed) *H. C. Montgomery*,
Chief Secretary.

PUBLIC WORKS DEPARTMENT.

(No. 121.)

From Sir *H. C. Montgomery*, Bart., Chief Secretary to Government, Fort St. George, to *J. P. Grant*, Esq., Secretary to the Government of India, 13 April 1853.

Sir,

1. IN obedience to the instructions conveyed in Officiating Secretary Major Wylie's letter of the 21st December 1850, a committee was appointed at this Presidency to investigate and report on the system of Public Works.

2. The Commission was composed of Mr. Bourdillon of the Civil Service (Collector of North Arcot), Major Frederick Cotton, Civil Engineer of the Seventh Division, and Major Balfour of the Artillery, Member of the Military Board.

3. These officers assembled at the Presidency, and commenced their labours on the 21st March 1851. Early in January 1853 they laid before the Government their First Report, of which I am now directed to forward five printed copies for the use of the Government of India, and to intimate that a similar number has been forwarded by the mail of the 13th instant to the Honourable Court of Directors.

4. The Government of India will perceive, from this very voluminous Report extending to 725 paras., that the Commissioners have entered most minutely into the subject which they were appointed to investigate, and their very lengthened proceedings will in some measure account for the time these inquiries have occupied.

5. It was, I am instructed to state, the intention of the Government to submit the Report, with a full review of its contents, but finding it so comprehensive that the review contemplated cannot be accomplished within any definite period, they deem it proper not to detain the Report longer, but to forward it for the information of the Government of India and the Honourable Court of Directors respectively, transmitting, separately, the expression of the views of this Government as soon as the whole subject has undergone the necessary discussion.

6. The present Report, it will be seen, is divided into 11 sections, the last of which, as intimated by the Commissioners, is a recapitulation of the contents of the preceding chapters.

7. The first four sections are devoted to the past history and present state of the department in all its branches, and to an exposure of the defects which the Commissioners conceive to exist in it.

8. The Commissioners, in the subsequent chapter (V.) proceed to develop the changes which they consider necessary to make the department thoroughly efficient in every respect.

9. The proposition of the Commissioners for withdrawing from the Revenue and Military Boards and the Superintendent of Roads* the control now exercised by them, and vesting the sole charge of Public Works in a new Board, composed of one Revenue Officer from the Civil Service, and two Engineer Officers, with the Chief Engineer as an *ex-officio* member, requires careful deliberation, and will meet with due consideration from the Government.

10. Passing on to the Executive Department, the Commissioners press on Government the urgent need of a large increase of the Engineer Establishment.

11. They recommend that the corps of Engineers, which now consists of two battalions of 46 officers, exclusive of nine supernumeraries, shall be augmented to 112 officers, to be disposed in four battalions, one of which shall be added immediately, and the other gradually, in the course of six years.

Vide Appendix (DD.), (EE.), (FF.)

Proposed Establishments.	Nos.	Charge.
		Rs.
Commissioned - - -	113	5,31,590
European Subordinate - -	204	3,85,201
Native - - ditto - -	725	2,35,560
Office Establishments - -	1,379	2,66,724
College - - - - - -		50,000
		14,69,075
Present Establishment—*vide* App. (HH.)		5,79,471
Increase - - *Rs.*		8,89,604

12. The Subordinate European Engineer and Native Professional Departments are also proposed to be largely increased, with office establishments of a suitable extent. Provision is also made for an Engineer College of Instruction. The recommendations of the Commissioners on the score of Establishments thus involve an aggregate charge (in the proportions marginally shown) of *Rs.* 14,69,075, or *Rs.* 8,89,604 in excess of the present charge under that head.

	Present Average of 5 Years.		Proposed.
Irrigation -	10,37,393	- -	22½
Roads, &c. -	4,20,762	- -	20
Buildings -	4,29,491	- -	4½
About -	19	lacs	48

13. The Commissioners dwell on the alleged neglect of roads and irrigation works, and calculating the profitable returns, directly and indirectly, from expenditure on such undertakings, they propose that the future outlay on Public Works shall be about 48 lacs annually, or about 29 lacs in excess of the present expenditure. The whole to be at the unfettered disposal of the Local Government.†

	Present.		Proposed.
Outlay - - -	19 lacs	about	48
Establishment -	6 „	about	15
	25 - lacs -		63

14. The proposition of the Commissioners thus provides that the annual expenditure in the Public Works Department shall be raised from about 25 to 63 lacs, being an increase of about 38 lacs per annum.

15. The Right Honourable the Governor in Council will content himself with this brief summary of the suggestions of the Commissioners. The comprehensive nature of their Report, the great changes advocated, and the importance of the questions discussed, both financially and with regard to the improvement of the country, and the welfare of the people, obviously call for careful and mature deliberation.

16. The Right Honourable the Governor in Council will not here notice the comments of the Commissioners on the alleged parsimonious policy of the Government of this Presidency and the Supreme Government in regard to Public Works, further than to observe that they appear to have overlooked the restrictions on expenditure necessarily imposed on Government by the financial condition of India during the late wars. The irrigation works of Tanjore, Trichinopoly and Tinnevelly, the fine ghauts and passes of Malabar and Canara, and the trunk roads leading west and south from Madras; and later, the magnificent works in progress on the Godavery, Kistnah and Pennar Rivers, evince the interest taken in the progress of improvement, and the manner the Government have made use of the means placed at their disposal.

17. I

* Under date the 21st November 1851, the Commissioners had proposed that the Road Department should be placed under the existing Board of Revenue Department of Public Works; this proposition was considered by Government, and Minutes recorded, copies of which are annexed, (*vide* Letter to the Honourable Court of Directors, dated 13th November 1852, No. 11. para 25), under date the 6th April 1852.

† Para. 684.

17. I am directed to request the attention of the Government of India to the separate Minutes herewith transmitted.

(signed) *H. C. Montgomery,*
Chief Secretary.

(True copy.)

(signed) *H. C. Montgomery,*
Chief Secretary.

MINUTE by the Honourable Mr. *Thomas.*

DRAFT LETTER, forwarding Report of the Public Works Commissioners.

IT is, I think, very desirable that this Draft should point out distinctly the misrepresentation of the views of this Government into which the Commissioners have been led by their ignorance of the records.

In various passages of their report they ascribe to this Government a practical indifference to, and even an unwillingness to sanction any expenditure on works for the improvement of the country; and the Government is represented throughout the Report as opposed for a series of years to such outlay; such appears to me the general tone and character of its statements.

It will be seen from the following extract from a letter to the Government of India, in 1848, how entirely this representation is at variance with fact. It was there observed and proposed to the Government of India, that "whilst this Government would counsel a wise economy in all branches, it is of opinion that a considerable outlay of its revenues, at this time, on internal improvements, even if there were no surplus (revenue), would prove, in the end, a more sound policy, and more beneficial to the country." (*See* also para. 21 of the same letter to Government of India, Financial Department, 3 January 1848.)

Vide Financial Letter to the Honourable Court, dated 8 Nov., No. 13, 1848.

Like misconception and misrepresentation of the views of Government exist in the statements of the Commissioners on the Road Department; and, as the Commissioners brought this subject under the notice of Government, in their letter of the 21st November 1851, that letter and the views of Government, with the minutes pointing out their errors,* should be adverted to in this review of their proceedings.

Vide Letter to the Honourable Court, Public Works Department, dated 13 Nov. 1852, No. 11, p. 25.

12 April 1853. (signed) *J. F. Thomas.*

(A true copy.)

(signed) *H. C. Montgomery,*
Chief Secretary.

MINUTE by the Right Honourable the President.

THE Draft of the Letter to the Government of India has just been returned to me, with certain remarks, embodied in a Minute of the 12th instant, by my Honourable Colleague, Mr. Thomas.

I have not had time to devote to a complete and careful perusal of the First Report of the Commissioners on the System of Public Works, and therefore I pass the draft of the letter above noted without comment; but as the Honourable Mr. Thomas has since briefly recorded his sentiments,† and as they have just come back to me, and my silence might be interpreted into dissenting from his views, I beg most distinctly to say that I entirely coincide in them, and shall endeavour, at some future period, to show my reasons for the opinion I have formed, that this First Report of the Commissioners is one-sided; that it misrepresents the actuating motive and real feelings of Government with regard to its measures for the improvement and amelioration of the country, and, therefore, that it is not entitled

* Para. 11, Minute of the Honourable Mr. Thomas, 6th March 1852, on Letter from the Board, 15th January 1852.

† Minute, dated 12th April 1853.

entitled to that confidence, though some facts set forth in it may be well supported, which such a document should command to render it of any general practical use.

13 April 1853. (signed) *Henry Pottinger.*

MINUTE by the Honourable Mr. *Eliott.*

DRAFT of Letter to the Government of India, to be transmitted with the First Report of the Commissioners on Public Works.

SINCE this Report came to me I have been so engrossed with other important subjects, particularly the Reports of the Special Commissioners on Malabar, that I have not been able to give attention to it; I am therefore unprepared to make any comment upon it. Having now nearly disposed of the business which has so much occupied me, I hope to have leisure to study the Report deliberately; and I shall diligently apply all the time I can spare from the papers passing in circulation, to a careful review and digest of it, in order that I may be able, as early as possible, to express my views upon the many important subjects of which it treats so largely and discussively.

13 April 1853. (signed) *D. Eliott.*

PUBLIC WORKS DEPARTMENT.

(No. 120.)

EXTRACT from the Minutes of Consultation, under date the 13th April 1853.

READ the following Report from the Commissioners appointed to inquire into and Report upon Public Works.

(Here enter 23d December 1852.)

Vide Printed Reports.

Ordered,—That five copies of the First Report of the Commissioners upon the Department of Public Works be forwarded to the Government of India, with the following letter.

Ordered, also,—That the same number of copies be forwarded to the Honourable Court of Directors, with a copy of the letter addressed to the Government of India, to the Secretary to the Government of India.

(Here enter 13th April 1853, No. 121.)

Ordered,—That the following Minutes be recorded:

Minute by the Honourable Mr. Thomas.

(Here enter 12th April 1853.)

Minute by the Right Honourable the President.

(Here enter 13th April 1853.)

Minute by the Honourable Mr. Eliott.

(Here enter 13th April 1853.)

(signed) *H. C. Montgomery,*
Chief Secretary.

(True Copies.)

(signed) *T. L. Peacock,*
Examiner of India Correspondence.

PUBLIC WORKS (INDIA).

RETURN to an Order of the Honourable The House of Commons, dated 15 April 1853;—*for*,

A RETURN "of all SUMS spent on PUBLIC WORKS (not of a Military kind) in *India*, since April 1834, keeping distinct the Amounts spent on the REPAIRS of OLD, and on the CONSTRUCTION of NEW WORKS, together with the Objects of the Works newly Constructed; and stating, when remunerative, the Amounts received from such Works."

East India House,
17 August 1853. } JAMES C. MELVILL.

(*Mr. Bright.*)

Ordered, by The House of Commons, *to be Printed*,
20 *August* 1853.

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FORT ST. GEORGE - - - - - - - - - - - p. 121

BOMBAY - - - - - - - - - - - - - p. 141

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MEMORANDUM.

Para. 1. THE Papers Nos. 1, 2, and 3 of the following list of contents will explain the impossibility of a Return being prepared for the exact period embraced, or in the precise form prescribed in the Order of the Honourable the House of Commons.

2. In the printed Return to the Order of the Honourable the House of Commons, dated 4th March 1850, No. 622 of 1851, has been given,

FOR BENGAL.

The particulars of and total expenditure on Public Works in the Civil Department from season 1839–40 to 1848–9 inclusive.

FOR FORT ST. GEORGE.

A digest of a general Report by the Superintendent of Roads, dated the 9th August 1848, on the Road Department, from its establishment to the 1st May 1848; also information in regard to district roads, with a statement of the charges incurred for the years 1838 to 1847 inclusive.

FOR BOMBAY.

As regards the Presidency of Bombay, it was pointed out that a "Return to an Order of the Honourable the House of Commons, dated the 20th December 1847, was presented on the 7th February 1848, which Return contained copy of the annual Reports of the Superintendent of Roads and Tanks within the Presidency of Bombay from the first (viz., that for season 1835–36) to the latest received to that time, or to season 1844–45 inclusive." The Reports for season 1845–46 and 1846–47 formed part of the Return No. 622 of 1851. Page 166 of the Return.

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3. The whole of the further information which can be supplied from the Reports received in continuation of the foregoing is contained in the present Return, and includes, as regards the Presidency of

BENGAL,

An analysis of a Report of the Military Board, dated the 8th September 1840, setting forth in a tabular form, and in alphabetical arrangement, all the information which the Government of Bengal could obtain on Public Works under the Military Board's general management at the time that the systematic preparation and printing of that Board's annual Reports was first ordered; also a statement compiled from the Reports of the Bengal Military Board for the official year 1849–50 and 1850–51, in continuation of and embodied with the previous statement for the official years 1839–40 to 1848–49.

FORT ST. GEORGE.

A digest of a further Report by the late Superintendent of Roads, dated the 17th October 1851, being in continuation of that dated 9th August 1848, giving information on the works in progress to the 1st May 1851; also a statement of the more important works executed under the Civil Engineer Department for 1848 and 1849, and of expenditure in the Civil Department of Public Works for the years 1848, 1849, and 1850.

BOMBAY.

Particulars of the formation of the Road and Tank Department in 1836; together with a tabular statement of the principal works executed by that department from its formation to the year 1850–51 inclusive, and a statement of expenditure compiled from the annual Reports of the Superintendent of Roads and Tanks, and of the Bombay Engineers.

RETURNS to an Order of the Honourable the House of Commons, dated the 24th February 1853, for "Copies of the Reports of the several Commissioners on Public Works at Bengal, Madras, and Bombay in the year 1851–52; of the Minutes of the Members of the Government thereon; and of any Orders or Despatches of the Court of Directors relating thereto," were presented to the Honourable the House of Commons on the 26th April 1853, for the Presidencies of Bengal and Fort St. George. The Return for the Presidency of Bombay will be presented on the meeting of Parliament in 1854.

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PRESIDENCY OF BENGAL.

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East India House,
17 August 1853.

T. L. Peacock,
Examiner of India Correspondence.

Note:—The Statements for the Presidency of Bengal for the series of years from 1839-40 to 1850-51 inclusive, and for the Presidency of Bombay, are arranged alphabetically. The preliminary Statement of the Military Board at Bengal, dated the 8th September 1840, and the Statements relating to works executed by the Civil Engineer's Department for the years 1848 and 1849, are preceded by an Index.

No. 1.

(No. 10.)

EXTRACT LETTER from the Officiating Secretary to the Government of *India*, in the Military Department, to the Military Board, dated 14 October 1839.

22. BEFORE closing this notice of the proceedings of your Board in the Department of Public Works, I am directed to inform you that, with the view of materially facilitating the object of diffusing correct information as to the principles by which the Government is guided in its appropriation of funds for such purposes, and on the measures of improvement which have been executed or are in progress, with their results, it is intended that the portions of the annual reports of your Board, referring to works which are intended in any degree for the public convenience and advantage, such as roads, bridges, canals, embankments, conservancy of rivers, &c., shall be printed and made public; and I am instructed to request that your Board will keep the ends of such publication particularly in view in drawing your reports. The President in Council hopes that this view may be acted upon with the report which it is probably the intention of your Board to submit to Government at an early period for the year 1838-39; and his Honour in Council deeming it right that the first publication should be preceded by a brief account, showing, as far as possible, the nature, extent, cost in original execution and subsequent maintenance, (and this, whether the outlay be from public or from private funds,) return or profit, and general results of each important public work under the control of your Board, it is the desire of his Honour in Council that your Board will turn your immediate attention to this important subject, and that your annual report for the past year may be accompanied by a preliminary account drawn up in accordance with the instructions above conveyed.

No. 2.

(No. 142.)

EXTRACT LETTER from the Secretary to the Government of *India*, in the Military Department, to the Military Board, dated 22 July 1840.

21. HAVING thus noticed the more important parts of your Board's reports, his Lordship in Council directs me to conclude with observing, that it is understood that provision will be made in future for submitting, in separate reports, the statements of proceedings regarding public works of general interest, and regarding the operations of the more peculiarly military establishment. Such division of your Board's annual reports is consistent with the orders of the Honourable Court, and the Governor-general in Council understands that it is intended so to prepare the former class of reports as to admit of their being printed and circulated, as may be thought advisable for general information.

No. 3.

Note.—As an introduction to the series of annual reports, and in compliance with the instructions given in the latter part of para. 22 of the letter from the Officiating Secretary to the Government of India, in the Military Department, to the Military Board, dated the 14th October 1839, a descriptive outline of works of public utility at the time (8th September 1840) under the Military Board's general management was submitted. In arranging the latter statement the works were classed under the general heads of roads and bridges, canals, embankments, and buildings, commencing with the works situated nearest to the Madras frontier, and proceeding gradually through the four circles of superintendence to the North Western frontier. The following is a brief analysis of this introductory report.

PRESIDENCY OF BENGAL.

No. 4.

INDEX to a TABULAR ANALYSIS of the Statement by the MILITARY BOARD at Bengal, dated 8th September 1840, of Works of public utility then under their general Management.

ROADS.

No. 16. Arrah to Sasseeram.
16. Arrah to Akberpore.
16. Arrah to Brookgunge.
22. Ajmere to Nusseerabad.
8. Burdwan Division.
7. Calcutta to Kishnegur.
15. Calcutta to Benares.
8. Culna to Burdwan.
12. Cachar to Munipore.
16. Chupprah to Mozufferpore.
16. Chupprah to Mootearee.
18. Chunar to Sukroot.
23. Cawnpore to Grand Trunk Road.
24. Cawnpore to Bittoor.
20. Deccan Road from Mirzapore to Jubbulpore.
21. Dhamow to the Deccan Road.
28. Delhi Division.
4. Grand Trunk Road.
10. Gowahattee to Sylhet.
27. Gazeeoodeenuggur to Meerut.
16. Hadjpore to Poosah in Tirhoot.
2. Juggernauth Road.
21. Jubbulpore to Titwarra Ghaut.
21. Jubbulpore to Hansi Ghaut.
21. Jubbulpore to Cullinghee.
28. Kurnaul Division.
29. Kumaon Division.
1. Madras Frontier to Cuttack.
8. Midnapore to Calcutta.
15. Moorshedabad to Benares.
17. Mogul Serai to Allahabad.
19. Mirzapore to Gopeegunge.
20. Mirzapore to Jubbulpore.
2. Poree to Bissenpore (known as the Juggernauth Road).
14. Patna to Gya and Shergotty.
13. Revelgunge to Moozufferpore.
25. Rohilcund Division.
21. Saugor to Jubbulpore.
26. Strand Road.

CANALS.

No. 32.) Balliaghatta.
33.)
41. Beejapore Water-course.
32. Calcutta Canals.
32. Circular Canal.
37. Delhi.
38. Dooab.
32. Entallee.
36. Feroze Shah's.
39. Gangum River.
40. Ganges Canals.
30. Hidjellee Khal.
33. Ishamuttee River.
36. Jumna River.
39. Koh River.
40. Kunkul on the Ganges.
39. Moradabad.
40. Mynpooree.
35. Nuddea Rivers.
37. Nuzufghur Jheel.
31. Oolabariah.
39. Rohilcund.
30. Tumlook Khal.
34. Tolly's Nullah.

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No. 44. Allahabad.
42. Balasore.
42. Burdwan.
42. Berhampore.
43. Behar.
43. Central Provinces.
42. Gunduch River.
44. Ganges River.
42. Hooghly.
44. Jumna River.
42. Midnapore.
42. South-western Provinces.
42. Southern and Northern Cuttack.
43. Sacri Bund.
42. Twenty-four Pergunnahs.

CIVIL BUILDINGS.

No. 52. Bathing Ghaut at Hurdwar.
47. Chittagong Jetty.
50. Churches, &c.
50. Divine Worship.
49. Educational Purposes.
45. False Point Lighthouse.
51. Hospitals.
52. Hurdwar Bathing Ghaut.
47. Jetty at Chittagong.
53. Juma Musjid, or Mosque.
46. Kedjeree Lighthouse.
54. Kotub Minar.
45. Lighthouse at False Point.
46. Lighthouse at Kedjeree.
48. Lighthouse at Point Palmyras.
53. Mosque, or Juma Musjid.
48. Point Palmyras Lighthouse.

No. 5.

TABULAR ANALYSIS of the BENGAL MILITARY BOARD's Preliminary Statement, dated 8 September 1840.

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
ROADS AND BRIDGES IN THE SOUTH-EASTERN CIRCLE:				*Rs.*	*Rs. a. p.*		
(1.) New road from the Madras frontier at Chutterghur to Cuttack.	- - To make the Dawk communication between Madras and Bengal more direct and secure than by the circuitous route by the sea coast; as likely to be advantageous for facilitating the march of troops between Cuttack and the northern division of the Madras army, and highly useful to the extensive tract of country known as the Khoordah estate, by affording the means of conveying its produce to the market of Cuttack.	- Measures 73¾ miles; was commenced by the Collector, but transferred to Department of Public Works in 1835.	Cuttack - - -	1,28,957	3,553 5 10	- - This road is open for dry weather communication, but some of the bridges and drains are still wanting, and bungalows and wells have to be constructed.	- - This road has at present 109 bridges; it is likely to be very useful when completed to Ganjam. The expense is borne entirely by the State.
(2.) Road from Pooree, through Cuttack and Midnapore, to Bissenpore, on the Grand Trunk Road.	- - This road is known as the Juggernath road, its construction having originated in a donation by Rajah Sookmoy Roy of 1,50,000 rupees for the construction of a road to the Temple of Juggernath.	- 261 miles in length; was commenced in 1822.	Bissenpore - -	15,21,696 or 5,415 per mile.	- - - -	Completed in 1830 -	- - This road has 816 bridges and drains. The whole of the outlay, with the exception of the 1,50,000 rupees, was borne by the State. Its annual repair, including the value of convict labour, averages 28,166 rupees. The road is almost invaluable as affording the means of communication throughout Orissa, and thence to Bengal.
(3.) Road from Midnapore to Calcutta, crossing the Hooghly at Oolabarriah.	- - Intended for general use, and accordingly employed for the conveyance of the Madras and Bombay mails, and used by parties proceeding to Juggernath from the Eastern Provinces.	Commenced in 1826	Calcutta - - -	*Rs. a. p.* 72,090 13 4	- - - -	Completed in 1830 -	- - The Hooghly, Damoodah, Roopnarain, and Cossye Rivers on this line were (with the exception of the last) extensive tideways, and are all crossed by ferries. The annual repair is about 2,078 rupees.
(4.) Grand Trunk Road from Calcutta to Delhi.	- - Of this road, only a very small portion is in the South Eastern Provinces. It may be considered as the main artery of land communication throughout Bengal and Hindostan.	- - The whole length is 770½ miles; its general breadth is 30 feet, which is increased to 40 when it approaches important towns.	Delhi - - -	- - It has for the most part been constructed by the labour of convicts, but exclusive thereof, it has cost, to the 1st May 1840, 12,28,279 rupees.	About *Rs.* 10,00,000	- - - -	- - This road is raised above the flood level in the rainy season. It has already 1,402 bridges of various sizes up to a waterway of 400 feet, and others have to be completed; it is metalled where the soil requires such protection, and is under the charge of seven executive engineers, and is provided with 47 staging bungalows, towards the cost of which 14,657 rupees have been contributed by Rajahs Seebchunder Roy and Nursingchunder Roy, and the whole of the remaining outlay, which is 20,603 rupees, exclusive of convict labour, is borne by the State.

(*continued*)

No. 5.—Tabular Analysis of the Bengal Military Board's Preliminary Statement, dated 8 September 1840—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
ROADS AND BRIDGES IN THE LOWER PROVINCES:							
Paras. 7 to 15 of Report. (5.) Presidency							The roads are maintained by the chief magistrate. The Military Board are not aware of their cost, but judging from the expensive nature of the material used, and the heavy traffic on them, it is doubtless large.
(6.) Suburbs of Calcutta							The roads are maintained by the civil architect, under the control of the superintending engineer. Of their original construction the Military Board is not cognizant, but their present maintenance costs, on an average, 10,000 rupees a year.
1st Division:							
(7.) Road from Calcutta to Kishnaghur; forms part of the road to Berhampore.		57 miles in length	Kishnaghur. It is to be extended 240 miles to the new Sanatarium at Darjeeling.	Original cost, *Rs.*2,69,630. The cost of the portion between Kishnaghur and Berhampore (51 miles in length) is not known.			It has of late years been kept in repair by the magistrates, but it is now to be repaired by the Department of Public Works; it is to be extended to Darjeeling; the last 30 miles are to be entirely carried through the hills; it is a work of immense labour, and is not yet finished.
Burdwan Division:							
(8.) Road leading to Culna	For the personal convenience of the Rajah of Burdwan.		Culna	*Rs. a. p.* 42,666 10 8 assigned by the Rajah.			In this division several roads are maintained at the public cost, but of the expense of their original construction the Board can give no account. They are not individually of great importance, though doubtless of much local utility. The average cost of their maintenance amounts to 7,100 rupees, and is defrayed by the State.
Division Eastward of Calcutta; viz., Dacca, Burrisaul, and Arracan Divisions, including the Province of Assam:							
(9.) Iron suspension bridge over the Boorolia Nulla at Gowahatty.				*Rs.* 5,311			In this division the roads are not under charge of the Department of Public Works, but have been constructed and maintained by the civil officers. More bridges are in progress under the executive engineers, which may be noticed in future reports.
(10.) Road over the Cossyah Hills from Gowahatty in Assam *viâ* Cheera Poonjee to Sylhet.							This road was surveyed, and estimated by Lieutenant Sale, of the Engineers. Its construction is in progress by the political officers at Gowahattee and Cherra Poonjee respectively.

Burrisaul Division:						
(11.) Military road from Dacca through Daoodcundy and Chittagong to Teck Naf.	- - - - - - - -	- - - - - - - -	- - - - - - - -	- - - - - - - -	- - - - - - - -	- - It is contemplated to complete this road by the substitution of masonry bridges along the whole line for the temporary wooden structures, which would require renewal every year; also to open a navigable communication through the interior of the Chittagong District to Arracan.
(12.) Road from Cachar through the Naga Hills to Munnipore.	- - To facilitate the communication between the Eastern frontier and the Burmese country.	- - Length not stated; the width is to be 10 feet. Commenced in 1837, under the superintendence of Lieutenant Guthrie of the Engineers.	Munnipore - -	- - 30,600 rupees, exclusive of the pay of a detachment of sappers and miners.	Not stated - -	Not stated - -	- - It is intended for foot passengers and laden cattle, and will have several bridges on its line; it is cut almost entirely through a mountainous and extremely difficult country.
3d, or Dinapore Division:						
(13.) Road from Revelgunge, near the junction of the Ganges and Gogra, *vid* Chupprah and Rewa Ghaut on the Gunduck, to Mozufferpore, the chief town in Tirhoot.	- - - - - - - -	55 miles in length -	Mozufferpore - -	- - The Department of Public Works is cognizant of an outlay of no more than 89,322 rupees on this road, but much more must have been expended.	- - - -	- - - -	- - In this division the roads maintained at the public expense are numerous. That from Revelgunge to Mozufferpore is one of the chief.
(14.) Road from Patna to Gyah and Shergotty.	- - - - - - - -	- - Length 80 miles. This road was not originally constructed by the Department of Public Works.	Shergotty - -	Not known - - -	- - The drainage being imperfect, the road is about being renewed and improved at an estimated cost of 70,222 rupees, under the executive officer.	Not stated - -	- - The repairs made heretofore have been effected by convicts.
(15.) Continuation of the road from Calcutta to Berhampore (*see* previous statement) by a series of district roads through Monghyr, Patna, Dinapore, Arrah, Buxar, and Ghazeepore to Benares.	- - - - - - - -	Length 430 miles -	Benares - - -	Not known - - -	- - - -	- - - -	- - These roads are not generally maintained by the Department of Public Works, but portions of them have been occasionally repaired by the executive engineers, by whom several very useful bridges have been built.
(16.) Other roads in this division, which are under the charge of local agents, such as the road from Arrah to Sasseeram; road from Arrah to Akbarpore; road from Arrah to Brookgunge; Hadjpore to Poosah in Tirhoot; Chupprah to Mozufferpore; Chupprah to Mooteearee in Chumparun, &c.	- - - - - - - -	- - - - - - - -	- - - - - - - -	Not known - - -	- - The repair of these roads by the Department of Public Works is under discussion, and estimates amounting to *Rs.* 72,880. 13 *a.* 10 *p.* have been sanctioned.	- - - -	These roads are highly useful.
ROADS AND BRIDGES IN THE CENTRAL PROVINCES:						
5th, or Benares Division:						
(17.) Road from Mogul Serai, on the Grand Trunk Road, eight miles from the Ganges at Benares to Allahabad, *vid* Chunar and Mirzapore.	- - Connects the Trunk Road with the great commercial mart of Mirzapore, without crossing the Ganges; and also the Grand Trunk Road with that from Mirzapore through Jubbulpore to the Deccan.	Length 92 miles -	Allahabad - -	Not known - - -	- - The whole line has lately been surveyed. Its completion by the Department of Public Works is now in progress. No detailed estimates have yet been received.	- - - -	- - This is a work of considerable importance, and its cost must, it is presumed, be borne by the State.

(*continued*)

No. 5.—Tabular Analysis of the Bengal Military Board's Preliminary Statement, dated 8th September 1840—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
Roads and Bridges in the Central Provinces—*continued.*							
5th, or Benares Division—continued.							
(18.) Road from Chunar, southward to Sukroot.	-- To facilitate the traffic with the southern portions of the district.	Length 16 miles -	Sukroot - - -	- - - - - -	6,325 rupees - -	- - - -	-- This work is intended to form, in the first instance, only a fair-weather road.
(19.) Road from Mirzapore, on the south bank of the Ganges, to Gopeegunge.	-- To join the Grand Trunk Road at Gopeegunge.	Length 16 miles -	Gopeegunge - -	-- The drains only were built by the Department of Public Works, at a cost of 1,495 rupees.	- - - -	- - - -	-- The earth-work was constructed by the magistrate. Other roads in this division, viz., from Benares to Jounpore, from Ghazeepore to Jounpore, and from Jounpore to Azinghur and Goruckpore, are not under the charge of the Department of Public Works.
(20.) Deccan Road from Mirzapore to Jubbulpore.	- - - - - - - -	-- Length 239 miles; breadth, 30 ft. Commenced 1824.	Jubbulpore - -	-- A little more than 8,00,000 rupees, including repairs, but exclusive of the labour of from 300 to 500 convicts for 15 years.	- - - -	Lately completed -	-- This road is provided with 479 bridges and drains of masonry, having openings varying in size from 6 to 78 feet, and 213 causeways or pavements of masonry for crossing the more shallow streams; one of these latter, however, is over the Belun river, and is 950 feet in length. The chief obstacle to the construction of this road was the ascent from the plains to the table land of Rewah; this is effected at the Khutra Pass, up an ascent of 690 feet by a winding path 2 ½ miles in length, and nowhere less than 18 feet wide. The slope is 1 in 20, and the work is considered highly creditable to the skill of Major Drummond. The work is extremely valuable as facilitating the traffic of the district near which it runs; but its full value cannot yet be appreciated, as the district roads are as yet seldom passable for carts.
(21.) Other roads in the Saugor and Nerbudda Territories of which the Department of Public Works has cognizance: viz.,							
From Saugor to Jubbulpore, *vid* Puttereea and Dhamow.	- - - - - - -	Length, 48 miles -					
From Dhamow to the Deccan Road at Jokeye.	- - - - - - -	„ 65 „ -					
From Jubbulpore to Tilwarra Ghât on the Nerbudda.	- - - - - - -	„ 5 „ -	- - - -	Nearly 2,00,000 - -	80 rupees per mile -	- - - -	-- They are to be completed as fair-weather roads, *i. e.*, roads which are passable at all seasons except in the rains.
From ditto to Jhansi Ghaut.	- - - - - - -	„ 23 „ -					
From ditto to Cuttinghee	- - - - - - -	„ 20 „ -					
(22.) Road connecting Ajmere with Nusseerabad.	- - - - - - -	„ 13½ „ -	Nusseerabad - -	- - - - -	8,000 rupees - -	- - - -	This road is in progress of construction.
(23.) Road connecting Cawnpore with the Grand Trunk Road.	- - - - - - -	„ 12 „ -	Grand Trunk Road -	- - - - -	26,000 rupees - -	- - - -	This road is not quite complete.
(24.) Road from Cawnpore to Bithoor, the residence of the ex-Peshwa.	- - - - - - -	- - - -	- - - -	- - - - -	- - - -	- - - -	-- This road is under construction. Its expense is defrayed by the Peshwar, aided by the labour of prisoners supplied by civil authorities.

ROADS AND BRIDGES IN THE NORTH-WESTERN PROVINCES:

8th, or Rohilcund Division:					
(25.) Roads and bridges			-- 27,070 rupees have been allowed by Government for the construction of some bridges. The sum already expended by Government for bridges and drains in this division is 1,29,675 rupees.		-- The subject of the Rohilcund roads generally has been referred to the Home authorities; in the meantime the repair of existing roads is managed by the local committees.
10th, or Agra Division:					
(26.) Strand Road	-- Considered to be of the greatest advantage to the city and station of Agra, both in appearance and utility.	-- Length two miles along the river face of the city. Average breadth 80 feet; raised 11 to 13 feet in height above the natural soil of the river's bank.		3,76,790 rupees	-- Of the sum 3,76,790 rupees, the sum of 3,55,105 rupees was paid to the starving poor, who could give but very inadequate returns in labour for the support they received. The remainder, 21,685 rupees, was expended for tunnels, ghauts, bridges, &c., required for the road. It is stated that the whole road having now had a trial of three rainy seasons, may be considered as safe and permanent. The whole sum expended by Government in the Agra division in employing the pauper population during the season of 1838, is stated at 6,12,431 rupees.
11th, or Meerut Division:					
(27.) Branch from the Grand Trunk Road at Gazeeoodeenuggur, on the west bank of the River Hindun, to Meerut.		Length, 29 miles	Meerut	*Rs.* -For earth-work 10,000 For bridges and drains - 7,763 For metalling - 75,788 TOTAL - *Rs.* 93,551 A further expenditure of 94,000 rupees is anticipated; 1,38,813 rupees have been expended on bridges by the Department of Public Works.	-- The earth-work is managed by a local committee. The bridges, drains, and metalling are to be constructed by the executive engineer. This will be a work of great utility, as the old road had, from long use, been worn to a lower level than that of the adjacent fields, and was consequently converted into a ditch in wet weather.
Delhi and Kurnaul Division:					
(28.) Drains and small bridges, exclusive of those on the Grand Trunk Road.				20,571 rupees	-- The roads in this division are under the charge of the civil authorities.
Kumaon Division:					
(29.) Bridges and staging bungalows.				-- 45,688 rupees, and for annual repairs 2,300.	-- In this division the roads are all mountain paths adapted for Hill Coolies, and on one line, viz., that from Bomourie to Almorah, for bullocks and tattoes. Their construction has been effected chiefly by detachments of the pioneer corps; but the bridges and bungalows have been erected by the Department of Public Works. There are 12 iron suspension bridges, four wooden bridges, and four staging bungalows, built by Government in this province.

The total outlay for roads, as above, is 57,34,223 rupees, but this does not include any sums which may have been expended by the civil authorities without the cognizance of the Military Board. In some districts the zemindars have agreed to contribute one per cent. on the land revenue, to form a fund for the improvement of internal communication; the proceeds of the fund are under the management of local committees, of which the executive officer of Public Works is generally a member; but the proceedings of the committees are not under the control of the Board. The profits arising from the farms of Ferries, are generally made available for the construction of roads, &c., "but as this is constituted by Regulation XIX. of 1816, a branch of the revenue," and its employment on roads is believed to be quite optional with the Government. the Ferry funds cannot be regarded as returns for money expended on works of utility.

(*continued*)

No. 5.—Tabular Analysis of the Bengal Military Board's Preliminary Statement, dated 8th September 1840—*continued*.

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CANALS IN THE SOUTH-WESTERN PROVINCES:							
(30.) Navigation Khals of Hijellee and Tumlook.	- - Are much used in the Salt Mehals for the transport of this article of trade; are invaluable in the south-west monsoon, as forming a safe line of communication, at a time when the open sea, and even the southern portion of the river Hooghly, is too rough for country craft.	- - - -	- - - -	- - Average cost about 5,000 rupees per annum.	- - Some works have recently been executed on these khals at an estimated expense of 23,138 rupees.	- - - -	- - A toll is levied on boats navigating these khals, on which money is expended, and which it is believed defrays the expense. The tolls are not managed by the Department of Public Works. Some of the Nullahs, such as the Banka Nullah, between the rivers of Huldee and Roopnarain, are under the control of the officers of the Salt Department.
(31.) Oolabariah Canal - -	- - Was formed by the excavation necessary for raising the earth-work of the road from Midnapore to Calcutta, crossing the Hooghly at Oolabariah (alluded to in the fifth paragraph of this report).	Length 15 miles -	- - Extends in a westerly direction to the Damooda at Murreeha, thence to the Roopnarain at Colar Ghaut.	- - As no separate bills were furnished of this canal, its construction may be considered in the cost of the road itself. Its annual clearance costs 1,321 rupees, and the tolls levied on boats using it have averaged 2,092 rupees for the last two years.	- - - -	- - - -	- - It is used only for boats coming down from the Burdwan and Hooghly Districts to Calcutta, and returning. It shortens the distance on the Damooda by about 22 miles, and about 36 by the Roopnarain, besides avoiding those portions of the rivers which are dangerous for country boats in the south-west monsoon.
(32.) Calcutta Canals: viz. 1st. The Circular Canal. 2d. Balliaghatta. 3d. Entallee.	- - These canals form an easy and convenient navigable communication round the greater part of Calcutta, and are a source of great convenience to the town.	Length 3 2/3 miles - „ 1 3/4 „ „ 1 „	- - From Chitpore to the junction with the Entallee Canal. From the end of the Circular Canal to the Salt Water Lake. From the Circular Canal to the east end of the Dhurramtollah Straits.	- - 16,45,404 rupees, including six * bridges, and the roads along the bank. The cost of their annual maintenance averages 31,646 rupees, and the tolls levied on boats, &c., for the last three years, 66,225 rupees.	- - - -	- - - -	- - Comprise a line of navigation, extending from the Hooghly at Chitpore to the Salt Water Lake. The amount of tolls realised during the official year 1849–50, was *Rs.* 1,82,989. 2.; the current expenses of the toll department amount to *Rs.* 15,853. 6. 6.; the lands, ferries, and fisheries attached to the canals realised 1,877 rupees. *Koolea Wooden Bridge. Balliaghatta Iron Suspension Bridge. Nurkuldanga - ditto. Manichtolla - ditto. Barrackpore - ditto. Dum Dum - - ditto.
(33.) Canal from the east end of the Balliaghatta Canal through the Salt Water Lake, thence by several natural Nullahs, aided by some artificial cutting to the Ishamuttee River.	- - By this route boats proceeding from the eastern ports of Bengal may reach Calcutta without approaching so near to the large estuaries and to the open sea as is done by the ordinary Sunderbund route.	Length 40 miles -	Ishamuttee River -	- - 3,77,188 rupees. Their maintenance involves an average outlay of 2,009 rupees per annum.	- - - -	- - - -	- - They gave no separate returns, as tolls are not levied further eastward than the Salt Water Lake. This passage is only used by boats of light draught, except in the rainy season.
(34.) Tolly's Nullah, to the south of the Esplanade of Fort William.	- - Forms a communication from the Hooghly River to the Sunderbunds, and to the Eastern Canals at Tarda.	Length 16 miles -	Tarda - - -	- - Its original cost is not known; its clearance costs 620 rupees per annum. Seven † bridges have been thrown across it at a cost of 1,79,381 rupees. The cost of the largest, the Hastings Bridge, which has a central opening of 176 feet, was partly defrayed from funds raised by subscription. The tolls amount, on the average of the last three years, to 49,381 rupees per annum.	- - - -	- - - -	- - This is an enlargement of a natural Nullah, which was rendered navigable many years ago by the agency of an officer whose name it bears. † Kalighaut Suspension Bridge. Kidderpore - ditto. Tollygunge - ditto. Gurriahhaut - ditto. Hastings - ditto. Allipore - - ditto. Prannath - - ditto.

CANALS IN THE LOWER PROVINCES:							
(35.) No artificial canals. Clearance of the Nuddea Rivers to facilitate the navigation in the dry season.	- - By which a communication between Calcutta and the Ganges is maintained.	- - - - -	- - - - -	- - Average cost of the last 10 years, 32,840 rupees, including salary and establishment; average toll collections for the same period 1,44,858 rupees per annum, after deducting the expense of collection.	- - - - -	- - - - -	- - The balance of the toll collections in hand, to the 30th April 1840, is believed to be considerable, though its exact amount is not known. A hope is expressed that the judicious employment of this balance may ultimately lead to a more effectual opening of the rivers, so as to admit of the inland steamers passing through at all seasons, instead of adopting the circuitous route of Channel Creek and the Sunderbunds.
IN THE CENTRAL PROVINCES THERE ARE NO CANALS.							
CANALS IN THE NORTH-WESTERN PROVINCES:							
(36.) Feroze Shah's Canal from the Jumna.	- - The canals in the North-Western Provinces, though navigable for various portions of their length, and at certain times of the year, were all constructed with a view to irrigation.	- - Length 295 miles. It was originally constructed in the 14th century by the Emperor whose name it bears.	- - Neighbourhood of Hissar.	- - Cost of reconstruction about 10,33,170 rupees. Total amount expended to the end of April 1840, 15,66,502 rupees. The direct return is obtained by water rent paid at the rate of eight annas per biggah for each crop, or one rupee per biggah per annum. The amount levied as water rent in 1839 was *Rs.* 2,58,826. 10. 9.; the total amount realised has been 21,57,731 rupees. The value of the indirect return cannot be stated, as it depends entirely on improved agricultural produce, on the security which artificial irrigation affords against the effect of drought.	- - These three canals form what are called the "Canals west of the Jumna." The original cuts had fallen into disuse and consequent decay during the disturbed period which marked the fall of the Mogul Empire, and their condition having attracted notice soon after the country came into the possession of the British Government, they were surveyed by Lieutenant Blane of the Engineers, in 1817, and the necessary expenditure having been sanctioned, they were opened in 1820.	- - The utility of the Feroze Shah Canal may be conceived from the fact of the wells in the neighbourhood of Hissar being generally 130 feet deep, and the water obtainable from them being all more or less impregnated with salt. The extent of ground irrigated from these canals amounted to 2,58,626 biggahs in 1839.
(37.) Delhi Canal - - -	- - Intended to convey water from Feroze Shah's Canal, near Kurnaul, to the capital city of the empire.	- - Length 85 miles. Was constructed in the 17th century by an opulent nobleman named Ali Murdhun Khan.	Kurnaul - -				
(38.) Branch from Feroze Shah's Canal, near Kurnaul, to Rohtuck.	- - - - - - -	Length 45 miles -	Rohtuck - -				
CANALS IN THE NUJUFGHUR JHEEL COUNTRY:							
Canal from the west end of the Jheel to the Jumna above Delhi.	- - For draining the country, which is over-flooded every rainy season; the land of which, when the waters are dried up, is extremely productive.	- - - - -	Jumna River - -	- - - - - -	58,782 rupees - -	- - The work is now on the eve of completion.	- - It is supposed that the rent of the recovered land will very soon repay the expenditure.
Doab Canal. Its line runs from where the Jumna leaves the hills.	- - These canals are used for floating timbers, and for the conveyance of lime on small boats, but their employment as navigable communications is insignificant, when compared with their use as channels for the conveyance of streams for irrigation.	- - Length about 130 miles, supposed to have been constructed in the time of Mahomed Shah, one of Aurungzebe's successors. It had been entirely abandoned, and in some places its trace quite lost, when the Seharunpore district came into the possession of the British Government. Examined by Lieutenant Tod in 1810. Complete survey, with plans, sections, &c., made by Lieutenant De Bude, Engineer, in 1822-23. The re-opening of it was entrusted to Captain R. Smith, Engineers. Since its restoration, it has been under charge of Captain Cautley, Artillery; the outlay since he received charge of the works has been 5,79,164 rupees, and the return from water rent, mills, &c., 5,13,150 rupees.	Delhi - - -	- - Cost of restoration 4,67,512 rupees.	- - - -	Restored in 1831-32	- - Captain Cautley has met with many unforeseen difficulties in the efficient maintenance of this valuable work, which have arisen chiefly from the slope of the country, and the sandy nature of its bed. The absence of all measures for providing against this difficulty, is a sufficient proof that the work could scarcely ever have been in full use in former days; but by the construction of locks and falls of masonry, the evil has been remedied, though at considerable cost. When it is considered that the drought of 1837-38 was the occasion not merely of loss of revenue, but of great loss of life from absolute starvation, it must be allowed that the utility of a canal like this, by which full 71,530 biggahs were enabled to give a good average crop, is not easily measured by mere money valuation.

(*continued*)

No. 5.—Tabular Analysis of the Bengal Military Board's Preliminary Statement, dated 8th September 1840—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
MORADABAD CANALS:				*Rs. a. p.*	*Rs. a. p.*		
(39.) Canal between the Koh and Ganjam Rivers.	Irrigation	This work was sanctioned on the 19th April 1839, after a survey, and on plans, &c. prepared by Lieutenant Anderson, Engineers.	Ganjam River		Estimated amount of cost, 51,218 rupees.	Not stated	There appears every reason to hope, that the system of artificial irrigation, so happily exemplified in the Jumna Canal, may be very generally adopted in Rohilcund.
(40.) Proposed Canal from the Ganges to Kunkul, to pass near Meerut and Coel, and finally to join the River Esun, near Mynpooree.	Irrigation	In 1836, Captain Cautley, Superintendent of the Dooab Canal, suggested the practicability of making the waters of the Ganges available for irrigation on the eastern side of the Dooab, and was instructed to make surveys.	River Esun		26,04,749	This work is at present under the consideration of Government.	—
(41.) Beejapore water-course in the Dehra Dhoon, between the Touse, the Arsun, and the Bundal Rivers.	Irrigation			15,000		Not yet quite complete.	Its utility is considered likely to be very great, as compared with its cost, and to be the means of bringing an extensive tract of forest land into cultivation.
The total amount expended on Canals, as above, is 49,63,288 rupees; and the returns in water rent, tolls, &c., is now 3,47,386 rupees per annum.							
EMBANKMENTS, SOUTH-WESTERN CIRCLE:							
(42.) Embankments, in— Northern Cuttack, Southern Cuttack, Balasore, Midnapore, Hooghly, The 24 Pergunnahs, Burdwan	They are intended, near the sea, to protect the interior of the country from inundation on occasions of high tides, and in inland tracts, to prevent floods of the rainy season from overflowing the banks of rivers.	Aggregate length, 3,459 miles, their height and mean thickness varying from 20 feet by 55 feet to the smallest size.		Came under charge of Military Board in 1831, since which period the amount expended is 16,67,822 rupees, including the charges of superintendence. The annual average outlay is 87,130 rupees.			The system at present followed, is believed to have been in force before the land came under the control of the British authorities. All that has since been done, has been to endeavour to introduce a gradual improvement in the dimensions and position of the earthwork, and to establish conjointly with the Zemindars, who would more immediately benefit by the change, sluices of masonry in the banks. These works are as yet few in number, but are coming by degrees into more general use. As regards returns for the expenditure, the maintenance of the embankments is believed to constitute

EMBANKMENTS, LOWER PROVINCES:							
Embankments on the Hooghly River, in the Berhampore Division.	- - - - - - -	- - - -	- - - -	-- Have cost, since 1831, 1,34,286 rupees; and their annual maintenance costs about 11,000 rupees.	- - - -	- - - -	one of the items of detail on which the gross rent, paid by every ryot, is calculated; in some cases the Government receive this, and in others the Zemindars; on this point no certain information can be given, but it is known that the Rajah of Burdwan pays to Government 53,742 rupees per annum on this account, and that the whole of this sum is not expended; there is no reason to suppose that in any estate throughout the embanked districts, the sum assigned as Pool Bundee falls short of the actual expenditure.
Bunds on the Gunduck River, in the Dinapore Division.	- - - - - - -	- - - -	- - - -	-- Have cost, since 1830, 1,90,826 rupees. Their average annual maintenance costs 19,000 rupees.	- - - -	- - - -	
EMBANKMENTS, CENTRAL PROVINCES:							
(43.) Sacri Bund, in the Behar District.	-- For the purpose of diverting the stream of the Sacri River towards the western portion of the Behar District.	-- Has been lately constructed.	- - - -	18,218 - -	- - - -	- - - -	—
(44.) Bunds on the Ganges and Jumna, at Allahabad.	-- Protect the town, and a considerable extent of land near the junction of the rivers, from inundation.	- - - -	- - - -	-- Have cost 30,190 rupees in the last (10) ten years.	- - - -	- - - -	-- Are of the greatest utility. They were breached in 1838 by a flood of unprecedented height, when a considerable portion of the town and neighbouring country were inundated, and very great loss ensued.

The total amount expended on Embankments, as above, since 1831, has been 20,41,342 rupees; there is no reason to suppose that the assessments under the head of Pool Bundee are not equal to the outlay.

BUILDINGS OF GENERAL UTILITY, CONSTRUCTED UNDER THE DEPARTMENT OF PUBLIC WORKS, IN THE SOUTH-EASTERN, LOWER, CENTRAL, AND NORTH-WESTERN PROVINCES:							
(45) Lighthouse at False Point	- - - - - - -	-- Built in the year 1837–38.	- - - -	-- Cost, including superintendence, 59,245 rupees for the building, and 23,750 rupees for the light-room, or lantern; total, 82,995 rupees. It is presumed, that the pecuniary returns derived from this building, are included in the port dues of Calcutta.	- - - -	- - - -	-- The building contains apartments for the lightkeeper, and has separate rooms for the native establishment.
(46.) Lighthouse at Kedjeree -	- - - - - - -	- - - -	- - - -	-- Not known. Cost of annual repairs about 450 rupees.	- - - -	- - - -	-- This building is of similar nature as the preceding.
(47.) Jetty at Chittagong -	For landing goods - - -	-- Projects 115 feet into the tideway.	- - - -	6,706 - -	- - - -	Just completed -	-- Of this work the local officers make very favourable reports.
(48.) Lighthouse at Point Palmyra.	- - - - - - -	- - - -	- - - -	Not known - - -	- - - -	- - - -	-- This was of a similar construction to the lighthouses at False Point and Kedjeree, but the encroachment of the sea on the sandy soil at its base has caused its abandonment.

(*continued*)

No. 5.—Tabular Analysis of the Bengal Military Board's Preliminary Statement, dated 8th September 1840—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
Buildings of General Utility, constructed under the Department of Public Works, in the South-Eastern, Lower, Central, and North-Western Provinces—*continued.*							
(49.) Buildings for educational purposes.	- - - - - - - -	- - - - -	- - - - -	- - 2,20,444 rupees, exclusive of five of small value, of which the cost is not known. Cost of annual repairs about 4,408 rupees.	- - - - -	- - - - -	- - There are (11) eleven of these buildings under charge of the officers of the Public Works Department.
(50.) Places of Divine worship	- - - - - - - -	- - - - -	- - - - -	- Aggregate value, 7,83,361 rupees; cost of annual repairs, 15,667 rupees; some portion of the original cost is believed to have been defrayed by private subscriptions, but to what extent is not known.	- - - - -	- - - - -	- - There are (22) twenty-two of these on the books of the Public Works Department.
Hospitals - - - -	For insane and other sick persons	- - - - -	- - - - -	- - Cost of construction, 46,740 rupees; cost of repairs, about 934 rupees per annum.	- - - - -	- - - - -	- - There are (5) five of these, exclusive of those provided for the military, or for prisoners in gaols.
The total sum expended on public buildings, as above, is 11,40,246 rupees, but there are in addition several miscellaneous works constructed at the expense of the State, regarding which, from their not being included in the Returns of Executive Officers, the information is very imperfect. Thus the following works are known to have been constructed at the expense of Government:							
Stone bathing ghauts at Hurdwar.	- - In consequence of a fatal accident which occurred at the great fair of Koom Mela, in 1820.	Constructed in 1821	- - - -	- - 20,000 rupees, including the cost of superintendence.	—		
Repair of the Great Mosque, or Juma Musjid, at Delhi.	- - In consequence of injury caused by lightning.	- - Constructed in 1820–21.	- - - -	20,000 rupees.	—		
Repair of the Kotub Minar -	- - - - - -	Constructed in 1823	- - - -	25,000 rupees - -	- - - - -	- - - - -	- - The adjacent buildings were also cleared.

The Military Board remarked, " while the works of various descriptions of which we have some knowledge appear to have cost in the aggregate 1,39,64,099 rupees, that sum cannot be considered as the total amount expended by Government for works of public utility, nor have we the means of ascertaining what that amount may be."

Report dated Fort William, 8 September 1840.

The following Statements have been prepared from the series of the Board's annual Reports from the official year 1839–40, to that of 1850–51 inclusive.

No. 6.

STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive.

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
ROADS AND BRIDGES, SOUTH-EASTERN PROVINCES:				*Rs.* a. p.	*Rs.* a. p.		
Roads from the Town of Aeng, in Arracan, to Nagatongu and Thorowah, and for the construction of Bridges.	- - - - - - -	Sanctioned 1840–41 -	- - - -	17,823 7 4	- - - -	Season 1840–41 -	- - Seven of the bridges to be restored, were destroyed by the Burmese in their flight from Arracan to Ava, in the year 1824.
Akyab:							
Construction of two wooden Bridges over the Peck Tock Kying Nullah.	- - To replace old bridges, which were originally constructed of indifferent materials by the Mughs of the Province.	- - Sanctioned 12th January 1841.	Akyab - - -	5,869 11 1	5,470 11 3	Completed 1842–43 -	- - The breadth of these bridges, as first sanctioned, was 18 feet for both; but, subsequently, the Government authorised the width of one to be increased to 22, and the other to 24 feet. This has consequently increased the expense by *Rs.* 608. 2. 7.
Construction of five masonry bridges over Nullahs.	- - For maintaining an uninterrupted communication at the station.	- - Sanctioned 16th February 1841.	- - - -	6,076 10 7	5,272 - 2	- - Completed season 1842–43.	—
Construction of Pucka Drain Bridges in the town.	- - The necessity for this work, was brought to the notice of Government by the local civil officers.	- - Sanctioned 18th May 1841.	- - - -	875 - 1	- - - -	- - Constructed season 1842–43.	—
Construction of two Pucka Bridges.	- - - ditto - - - -	- - Sanctioned 27th April 1841.	- - One on the road towards Nagapara, and the other in the town, on the bank of the Peck Sik Kyong.	1,445 12 2	- - - -	- - ditto.	—
Restoration of the Bund and Sluice at Akyab, and clearance of Jungle.	- - For the purpose of drainage, and as essentially necessary to the salubrity of the station.	- - Sanctioned 3d April 1843.	Akyab - - -	3,482 6 10	7,203 9 2	- - Completed season 1843–44.	- - This work, which was sanctioned in 1841–42, at an estimated cost of *Rs.* 6,637. 14. 6., was completed for *Rs.* 7,527. 10. 4.; but it was destroyed by an irruption of the sea, during a violent storm, on the 15th May 1842, through a want of sufficient height. It was raised five feet above the highest spring tides; nevertheless the sea, on this occasion, overtopped the bund by five feet. The saving has accrued chiefly by a reduction of the rates, and also by the employment of convicts on a portion of the work.
Construction of two Bridges at, in the Arracan Division.	- - Required to keep open the communication between the station and the point bungalows, belonging to the residents.	- - Sanctioned 18th August 1840.	- - - -	4,375 10 2	5,523 3 9	- - Completed season 1842–43.	—
Construction of two Pucka Drain Bridges in the town of Akyab.	- - - - - - -	- - Sanctioned 28th November 1842.	- - - -	351 7 2	- - - -	- - ditto.	—

(*continued*)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
ROADS AND BRIDGES, SOUTH-EASTERN PROVINCES—*continued.*				*Rs. a. p.*	*Rs. a. p.*		
Aeng Road and Pass: Construction of a Bridge, and repair of seven others, and of Travellers' Houses.	-- These works are intimately connected with the interests of the trading community.	-- Sanctioned 9th September 1844.	- - - -	- - - - -	1,161 11 1	—	
Agrachour to Baildah: Construction of a Foot Road, connecting the Contar with the Cuttack Road.	-- To facilitate the transmission of the dâks between Contar and Midnapore.	-- Sanctioned 16th April 1845.	Baildah - - -	1,873 6 8½	1,886 8 7	—	
Akyab:							
Repairs to the Phoongaparrah Bridge.	- - - - - -	-- Sanctioned 28th June 1848.	Akyab - - -	928 14 4	- - - -	Season 1849–50 -	-- The planking, beams, rails, &c., have been renewed.
Construction of a wooden Bridge on the Gaol Road.	-- The necessity for this work was pointed out by the officer commanding at Akyab.	-- Sanctioned 19th October 1850.	ditto - - -	- - - - -	1,371 - -	- - - -	-- The estimate is exclusive of the costs of excavations, which will be performed by convicts.
Construction of a wooden Bridge at Nazerparah.	- - - - - -	-- Sanctioned 6th November 1850.	ditto - - -	- - - - -	1,672 12 9	- - - -	-- An estimate was passed in 1846 for a masonry bridge, but, owing to the badness of the soil, it was considered preferable to construct a wooden one.
ROADS AND BRIDGES, LOWER PROVINCES:							
Assam Roads:							
Lower Assam:		Length.					
From Rahu to Gobba - -	- - - - - -	27 miles - -	Assam - - -	- - - - -	981 7 5	- Completed season 1842–43.	-- These are unmetalled roads, and their width is 16 feet; they have been raised where necessary.
From Talia Mhookutta to Lowkhoah.	- - - - - -	10 „ Sanctioned 9th January 1838.	ditto - - -	- - - - -	9,917 7 11		
From Nowgong Division Roads	- - - - - -	9 „	ditto - - -	- - - - -	972 9 -		
From Borallygong to Soonaree	- - - - - -	3 „	ditto - - -	- - - - -	297 10 7		
From Nowgong to Demoorooguoree.	- - - - - -	2 „ - -	ditto - - -	- - - - -	533 8 -		
Repair of the Road from Kulling River to Koliabur.	- - - - - -	72 „ Sanctioned 22d August 1842.	- - - -	- - - - -	2,474 1 -	-- Completed season 1842–43.	-- This road will be made 12 feet wide, with 106 wooden bridges and drains. Proposed width, 15 feet.
From Koliabur to the Dunsary	- - - - - -	60 „	- - - -	- - - - -	- - - -	- - - -	
Repair of Road between Nowgong and Tezpore.	- - - - - -	17 „ Sanctioned 26th April 1843.	- - - -	4,924 - 8	4,924 - 8	- - - - Completed 1846–47	-- Width, 12 feet, with 22 bridges and drains.
Repair of Road from Rah to Daboka.	- - - - - -	23½ „	- - - -	5,152 15 3	6,528 3 6	- - - -	-- Width, 12 feet, with wooden bridges and drains. The saving of *Rs.* 1,375. 14. 3. on the estimate has been effected by the reduction of rates.
ROADS AND BRIDGES, CENTRAL PROVINCES:							
Ajmere and Nusseerabad Road: Metalling of.	-- Metalling of such portions as, from the nature of the soil, may require the construction of a hard artificial surface.	-- Length of road, 13 miles 4 furlongs; aggregate length requiring to be metalled, 6 miles 4 furlongs and 6 yards. Sanctioned 12th January 1848.	- - - -	- - - - -	6,472 15 -	—	

Agra and Bombay Road: Construction of Bridges over the Bubbookee Nuddee and the Bhowkerie Nuddee.	- - - - - - -	- - Sanctioned 9th September 1849.	- - In the Province of Malwa.	1,749 3 11 {For bridge over the Bubbookee Nuddee} 1,802 5 9 1,466 12 2 {For bridge over the Bhowkerie Nuddee} 1,597 - -		- - Completed season 1849–50.	- - Both bridges are on the territory of the Maharajah Scindia.
Construction of a Bridge over the Muddy Nullah.	- - The construction of this bridge is necessary, and is considered to come within the scope of the original intentions in regard to the Agra and Bombay Road.	- - To consist of one arch of 24 feet span. Sanctioned 15th October 1849.	- - The Nullah crosses the main road about one mile north of the Residency at Indore.	- - - - -	2,862 - -	- - - -	- - In the territory of the Maharajah of Holkar.
Construction of a Bridge over the Mhow Nullah.	- - Commenced under instructions from the Lieutenant-governor, by whom it is considered desirable to bridge over as many of the small muddy nullahs as may be practicable, which abound on this road, and materially obstruct all traffic, and to improve the fords which cross the rocky beds of rivers.	- - The bridge is of one arch, 12 feet span. Sanctioned 28th October 1848.	- - On the Agra and Bombay Road.	739 3 5½	872 - -	—	
Ford on the Parbutty River -	- - To provide for a passage for wheel carriages across the Parbutty River on the general level of the channel during the dry season only.	- - Sanctioned 6th September 1849.	Near Barsud - -	2,910 8 5¾	- - - -	Completed - -	This to be a paved ford.
Construction of a Bridge over the Muddy Nullah.	- - Considered necessary for a fair-weather road.	- - The bridge to be of one arch of 30 feet span. Sanctioned 4th February 1850.	At Chuper Kajhora -	- - - - -	4,167 - -	—	
Construction of a Bridge over the Muddy Nullah.	- - With a view to make the line of communication more perfect.	- - The bridge is of seven arches of six feet span each. Sanctioned 2d December 1848.	- - At Dolterin, between Bisura and Puchore.	1,477 2 6¾	1,711 13 5	- - - -	n the territory of the Rajgurh Raja.
Construction of Bridges over the Muddy Nullah.	- - ditto - - ditto - -	- - One bridge of two arches, eight feet span; one bridge of three arches, seven feet span; one bridge of eleven arches, six feet span. Sanctioned 12th September 1849.	- - Over the Boranna, the Par Muddy, and Belloda Village Nullahs.	- - - - -	2,706 - 10	—	
Construction of a Bridge over the Kukooba Jheel.	- - - - - -	- - This bridge is of three arches each, of 7½ feet span. Sanctioned 4th April 1850.	- - Crosses the main road about 7¼ miles south of Agra.	- - - - -	966 - -	—	
Construction of a Bridge over the Gudha Muddy Nullah.	- - - - - -	- - This bridge is of six bays, each four feet wide. Sanctioned 25th March 1850.	- - Crosses the main road between Sossam and Gohur.	- - - - -	1,338 - -	- - - -	In the territory of Maharajah Scindia.
ROADS AND BRIDGES, NORTH-WESTERN PROVINCES:							
Agra Strand: Bridging of drains on the.	- - - - - - -	Sanctioned 1848–49.	Agra - - -	7,910 15 -	9,620 7 1	- - Completed season 1842–43.	—
Agra Bridge: Over the Doorukar Ravine.	- - On account of the inconvenience experienced by the public, who have occasion to pass by the bridge and bazar near the Tripolish *viâ* Cauzeepara, owing to there being but one narrow confined road at this entrance of the town.	- - Sanctioned 7th December 1840.	- - - -	910 8 2	1,113 2 4	- - Completed season 1841–42.	—

(*continued*)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839-40, to 1850-51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
ROADS AND BRIDGES, NORTH-WESTERN PROVINCES—*continued.*							
Agra to Mynpooree:				*Rs. a. p.*	*Rs. a. p.*		
Construction of Bridges over the Jhera River and Guddakhur Ravine, and over the Peelakar Rivulet.	- - This road is of much importance, being a direct communication between Agra and Futtyghur.	Sanctioned 1840-41 -	Mynpooree - -	Bridge over the Jhera - - 7,063 8 6 Ditto over the Peelakar Rivulet 5,151 10 - *Rs.* 12,215 2 6	13,017 12 5	- - Completed season 1842-43.	—
Construction of a Bridge over the Urind Nuddee.	- - - - - -	- - Of three arches of 40 feet span. Sanctioned 3d January 1845.	- - Crossing the Agra and Mynpooree Road, 15 miles from Mynpooree, at the village of Kulhore.	17,071 - 1	23,874 3 7	- - Completed season 1846-47.	- - The savings on the sanctioned estimates, viz., *Rs.* 6,803. 3. 6., and *Rs.* 10,681. 15. 8. respectively, are owing to much of the masonry work having been dispensed with, in consequence of the soil being more favourable than was originally expected, and to other judicious deviations from the plan. A reduction of rates has also contributed in effecting these savings.
Construction of a Bridge over the Singar Nullah.	- - - - - -	- - To consist of two elliptic arches; the centre one of 45 feet, and the two arches on each side of 40 feet respectively. Sanctioned 3d January 1845.	- - Crossing the Agra and Mynpooree Road, 23 miles from Mynpooree, at the village of Nrown.	22,951 5 7	33,633 5 3		
Agra and Bombay Road:							
To the Nerbudda River - (*See* Paras. 13 to 17 of Court's Despatch, 30th January 1850, at page 148 of Parliamentary Return, No. 622, of 1851.)	- - A fair weather road adapted for hackeries or wheel conveyances, being much required between Agra and Bombay, it was determined in 1840 to improve, with occasional diversion, the existing road; the improvement was to comprise the removal of the principal obstructions in the ghauts, jungles, and in the passage of rivers and nullahs, or mountain streams.	Length, 1st portion: *Ms. fs. yds.* Agra to Indore - 370 3 102 Length, 2d portion: Indore to Akberpore on the Nerbudda - - 51 0 167 Length, 3d portion: Akberpore to Sindwa, 43 1 0 Length, 4th portion: Sindwa to Bombay 270 1 179 TOTAL - - - 734 7 8 Commenced in 1840.	Bombay - - -	- - The expenditure within the Bengal Division to November 1847 is stated as follows; viz., *Rs.* New work of road, 1,94,310 Superintendence, 1,13,106 Repairs, &c. - 47,542 3,54,958 The sum expended on two divisions of the road within the Bombay Presidency to 30th April 1848, exclusive of repairs, was - - 9,74,811 There has also been a further sum sanctioned for various useful purposes of about 7,000 Making a Total of *Rs.* 13,30,769	11,00,000 - - (eleven lacs) without metalling.	- - - -	- - Major Drummond has brought his survey of the portion of the line between Agra and Nerbudda to a close; and with reference to the enormous expense which must be incurred for such a road as would be available throughout the rainy season, the Government has come to the resolution to limit the work to an improvement of the existing roads, and in a great degree to give up the new lines which had been proposed. The Government on the 30th June 1840 sanctioned an estimate of 1,20,000 rupees, exclusive of engineer's salary and establishment, for improving the worst parts of the road between the Chambul River and Suppree, 115 ½ miles; and between Indore and the Nerbudda River, 76 ½ miles; so as to be practicable for wheeled carriages, including a branch road from Suppree to Gwalior. An increase in the width of the Ghauts from 10 to 14 feet was authorised on 3d January 1843. Returns were called for in 1848 with a view to undertaking the improvement of such detached parts along this great line of road as urgently required either construction or repair, when the following estimates were submitted, and recommended for immediate sanction, viz.: For the repair of about 20 miles of the road in Candeish *Rs.* 1,00,000 For completing part of the road under charge of the Civil Engineer, a distance of 93 miles, with bridges and drains - 2,46,514 For bridging a portion of the road between Soonghur and Dhoolia - - - - - - - - - - - - 65,000 For completing the unmetalled portion of the line in Kandeish 3,00,000 TOTAL - - - *Rs.* 7,11,514 These works, however desirable, were considered too costly to be undertaken at present. A sum of 4,224 rupees was sanctioned in June 1849 for converting into a fair-weather road the line of 43 miles in length, between Scindwa and the Nerbudda, his Highness Holkar having contributed a moiety. The Court, in January 1850, sanctioned the annual expenditure of 28,700 rupees for the maintenance of this road within the Bengal Presidency.

Construction of a well at the top of the Kilner (Gara) Ghaut.	-- On a representation from the Resident at Indore of the very serious inconvenience experienced by troops and travellers from the want of water at that spot.	-- Sanctioned season 1845–46.	-- Between Deodat and Akbarpore.	594 14 8	760 14 5	-- Completed season 1846–47.	—
Agra: Proposed construction of a Suspension Bridge over the River Jumna.	- - - - - - - - - - - -	Agra - - - - - - - - - -		{ 5,33,378 - - / 4,51,749 - - }	- - - -	-- The first estimate is for a bridge of two spans of 500 feet each, with two half spans of 225 feet each, and a roadway 28 feet broad, supported by three chains; the other, with the same openings, supported by two chains. These estimates, together with others on the taper chain, or Dredgian principle, were held over, awaiting a report of a special committee on the causes of the failure of the Balli Khall Bridge on the Dredgian principle. Subsequent to these proceedings, the construction of bridges on the taper chain, or Dredgian principle, was generally prohibited by the Home Authorities. An estimate for a masonry bridge was then submitted, but the Lieutenant-governor being doubtful whether the same site would suit a railway bridge as would be selected for the ordinary traffic of the country, has suspended any ulterior proceedings. The proper site for a railroad bridge, it is supposed, would approach Agra by Ferozabad, two marches short of Agra.	

CIVIL BUILDINGS, SOUTH EASTERN PROVINCES—JUDICIAL:

Akyab:							
Construction of a Cutcherry -	-- To replace the existing cutcherry, not worth repairing.	-- Sanctioned 1st August 1839.	Akyab - - -	4,869 8 5	4,742 8 3	-- Completed season 1841–42.	—
Construction of a new Gaol -	-- To replace old buildings which are unserviceable and unworthy of repair.	-- Sanctioned 23d March 1841.	Akyab - - -	12,159 9 4	14,362 7 1	-- Completed season 1843–44.	-- The new gaol is equal to the accommodation of 320 prisoners.
Construction of a Sanitarium Bungalow, with bathing rooms and out-offices.	-- It is not stated for whose use the building is designed.	-- Sanctioned 9th January 1838.	-- Situated at the end of the Farquee's Rocks, two miles from the station of Akyab.	4,813 9 10	- - - -	-- Constructed in 1840–41.	—
Construction of a Treasury Record Room, malkanah, and cash-room, at the civil station.	- - - - - - - -	-- Sanctioned 19th October 1841.	Akyab - - -	5,741 15 6	6,414 15 9	-- Completed season 1843–44.	—
Amherst: Construction of a new Gaol at.	-- In consequence of the insufficient accommodation afforded by the existing gaol.	-- Sanctioned 11th January 1842.	Amherst - - -	3,445 4 4	5,106 14 3	-- Completed season 1843–44.	-- The gaol is intended for the accommodation of 280 convicts. The difference is owing to the employment of convicts, and to a reduction of the accommodation, with the concurrence of the commissioners. The dimensions sanctioned were 240×50, while those of the new gaol are 157×48.
Allipore Gaol: Construction of a Barrack and a Picket Shed.	-- For the gaol guard. The old guard-rooms were partly blown down by the storm of 3d June 1842.	-- Sanctioned 9th January 1843.	Allipore - - -	5,494 12 1	5,776 13 1	-- Completed season 1843–44.	-- These buildings are required for the accommodation of 211 men. The walls will be of masonry, and the roofs of tiles.

(continued)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839-40, to 1850-51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CIVIL BUILDINGS, SOUTH EASTERN PROVINCES—JUDICIAL—*continued.*							
Akyab: Construction of a Gaol Wall, with Sentry-boxes.	-- In consequence of a suggestion by the Commissioners of Arracan that all men sentenced to more than one year's imprisonment should be located at Akyab.	-- Sanctioned 17th May 1838.	Akyab - - -	*Rs. a. p.* 9,100 14 2	*Rs. a. p.* - - - -	Season 1838-39.	—
Construction of Wards within the above Gaol Wall.	-- The existing gaol buildings have become old, and unworthy of further repair.	-- Sanctioned season 1840-41.	ditto - - -	14,362 7 1	14,362 7 1	-- Completed season 1840-41.	-- The new wards will accommodate 120 prisoners.
Construction of a Sudder Hospital at.	-- Rendered necessary by the existence of a military police; the flotilla establishment, crews of vessels, &c., all requiring medical aid, in consequence of the insalubrity of the climate, as well as the ruinous condition of the old hospital.	-- Sanctioned 6th February 1843.	ditto - - -	1,703 1 -	1,397 11 9	-- Completed season 1844-45.	-- The new hospital will be 60 × 24, with a 10 feet verandah all round, the corners of which are to be partitioned off into separate rooms for the native doctor, dispensary, and operating rooms.
Allipore Gaol: Alterations and improvements to.	-- To improve the gaol, as regards cleanliness, salubrity, and discipline.	-- Sanctioned 22d June 1841.	Allipore - - -	20,734 13 10	22,377 15 8	-- Completed season 1843-44.	—
Akyab; Construction of six Drain Bridges.	-- Necessary to the cleanliness and salubrity of the town.	-- Of one arch of six feet, sanctioned 20th August 1845.	-- On the Chowreggya road.	1,942 5 8	2,292 - -	-- Completed season 1846-47.	—
Construction of a Bridge at Talee Bazar.	-- Required to replace bridges of wood, reported to be unsafe for wheel carriages; and as the line of road on which they are situated is considered the most important at Akyab, it is considered that they should be of the most durable description.	-- One arch of 20 feet span.	Akyab - - -	- - - - -	6,313 - -	—	
Construction of a Bridge at Nazirpah.		Twenty-four feet span	ditto - - -	- - - - -	4,998 - -	—	
Allipore Gaol: Putting up a Pump.	-- For raising water from the large tank in the gaol to the reservoir above it, to supply the different wards with drinking water.	-- Sanctioned 20th August 1845.	Allipore - - -	40 8 -	402 8 -	-- Completed season 1846-47.	—
Akyab: Construction of the Budder Mokam Stone Sluice.	-- This sluice, together with the bund at Akyab, was destroyed by a storm on the 15th May 1842.	-- Sanctioned 28th May 1845.	Akyab - - -	1,783 15 8	1,783 15 8	-- Completed season 1846-47.	-- The roadway over the sluice has been made sufficiently large to be safe and practicable for wheel conveyances. The reconstruction of the bund was reported in 1844.

Allipore Gaol: Alterations and improvements	To improve the gaol as regards cleanliness, salubrity, and discipline.	Sanctioned 22d June 1841.	Allipore	20,734 13 10	22,377 15 8	Completed season 1843–44.	The works sanctioned are as follows: The construction of aqueducts to carry water to the reservoirs in the several court yards, for drinking and other purposes; the construction of privies; the filling up of wells; the construction of partition walls with a view to the separation of the convicts into squads of about 100 men; the removal of the existing solitary cells to a more airy site, and the construction of an additional ward and working shed.
Construction of a Balagustee Guard-room to the.	This building will be of more durable materials than the last, which has been entirely destroyed by white ants.	Sanctioned 22d June 1845.	Allipore	606 – –	606 – –	Completed season 1845–46.	—
Akyab: Additions and alterations to the Cutcherry at.	For the better accommodation of the different civil officers.	Sanctioned 3d June 1844.	Akyab	– – – – –	2,306 9 3	– – – –	This building has been lengthened about 40 feet.
Allipore Gaol: Construction of a Retiring-room, with Anti-room, to the Cutcherry of the additional Judge.	These works were undertaken under a representation from the additional Session Judge of their necessity.	Sanctioned 25th May 1848.	Allipore	953 5 3	– – – –	Completed season 1849–50.	Additions and alterations to the cutcherry itself were also effected.
Allipore: Renewing the Roof of the Sepoy Guard-room.	In lieu of the old roof, condemned by a committee.	Sanctioned 20th June 1850.	Allipore	– – – – –	2,302 1 8	—	
Alterations and Additions to the Gaol Hospital.	Under a representation from the superintendent of the gaol, of the necessity for a better classification of the patients.	Sanctioned 18th October 1850.	Allipore	– – – – –	3,084 – 1	– – – –	The superintendent observed, that in the large gaol at Allipore the different kinds of prisoners are kept as distinct as can be; but in the hospital all the above classes, from the most atrocious and desperate convicted felon to the respectable freeman, male or female, are mingled together.
CIVIL BUILDINGS, LOWER PROVINCES—JUDICIAL.							
Arrah: Sudder Ameen's Cutcherry.	– – – – – – –	G. O. 23d January 1839.	Arrah	1,559 – –	– – – –	Season 1839–40.	—
Akyab: Construction of a Cutcherry at.	– – – – – – –	Sanctioned 1st August 1839.	Akyab	4,742 – –	—		
Arrah: Construction of a Dewanny or Civil Gaol.	No separate provision had been made for the confinement of civil prisoners, and, in consequence, persons of this class were mixed up with the common felons of the gaol.	Sanctioned 1st November 1842.	Arrah	3,437 12 7	4,649 10 5	Completed season 1844–45.	In the new gaol, and, at the suggestion of the Judge, separate accommodation is provided for prisoners of rank and caste.
Arrah Gaol: Construction of 60 Ventilators, and lowering Compound Walls.	For the better ventilation of the criminal wards.	Sanctioned 17th February 1848.	Arrah	492 7 10	412 4 6	Season 1848–49.	—

(*continued*)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CIVIL BUILDINGS, CENTRAL PROVINCES—JUDICIAL:							
				Rs. a. p.	*Rs. a. p.*		
Allahabad: Sudder Ameen's Cutcherry.	- - - - - - - -	- - Sanctioned 28th August 1839.	Allahabad - -	1,273 6 8	1,579 8 -	- - Completed season 1841–42.	—
Ajmere Gaol: Alterations to the.	- - - - - - - -	- - Sanctioned 24th December 1840.	Ajmere - - -	1,700 - -	1,700 - -	Season 1840–41.	—
Azimghur: Construction of a Record Room.	- - For the use of the Collector and Magistrate.	- - Sanctioned 23d March 1844.	- - - -	2,225 7 9	2,238 6 9	- - Completed season 1846–47.	—
Allahabad: Construction of an additional Room to the Judge's Cutcherry.	- - For the accommodation of the records.	- - Sanctioned 7th January 1851.	Allahabad - -	- - - - -	1,998 4 6	- - - -	- - The necessity for this additional accommodation was pointed out by the local civil authority.
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—JUDICIAL:							
Allyghur Gaol: Construction of an additional Ward.	- - In consequence of the insufficiency of space in the gaol.	- - Sanctioned 30th August 1841.	- - - -	1,484 4 10	- - - -	- - Constructed season 1842–43.	—
Agra:							
House for the Magistrate and Collector, and his Deputy.	- - The house which had been rented was no longer in a fit state for a public office.	- - Sanctioned 11th September 1842.	Agra - - -	- - - - -	11,956 13 9	Season 1842–43.	—
Erection of Offices for the Court of Sudder Dewanny.	- - - - - - - -	- - Sanctioned April 1843.	- - - -	20,392 9 3	17,501 - -	- - Completed season 1844–45.	- - These new offices will be built near the Secretariat Buildings, and the whole of the public buildings will be enclosed by a low wall.
Erection of Offices for the Board of Revenue.	- - - - - - - -	- - Sanctioned April 1843.	- - - -	- - - - -	11,067 - -	- - - -	- - The excess of expenditure is owing to a rise in the price of timber in the bazaar.
Construction of a Hospital Ward at the Foujdarry Gaol.	For the use of females - -	- - Sanctioned 4th November 1843.	Agra - - -	849 6 7	969 12 9	- - Constructed season 1843–44.	- - The necessity for this work was reported direct by the civil authorities to the Government.
Allyghur: Construction of a Gaol in the Fort.	- - To relieve the district gaol, by the withdrawal of life prisoners, and to lessen the expense for increased guards for the custody of convicts.	- - Sanctioned 2d March 1844.	Allyghur - -	- - These works suspended in season 1844–45.	66,989 1 -	- - - -	- This gaol is intended to accommodate 1,200 male and 200 female convicts. The whole of the buildings are to be surrounded by a ditch 14 feet broad and 12 feet deep, with a pucka wall 14 feet high in the centre. The slopes are to be secured with masonry revetments, and the bottom of the ditch and a few feet of the bottom of the slope to be substantially faced with masonry, and the ditch to be made considerably wider at top.
Agra: Construction of a Court House.	For the Sessions Judge - -	- - Sanctioned 3d June 1845.	Agra - - -	6,436 10 -	8,558 12 9	- - Completed season 1846–47.	—

Allyghur: Construction of Cutcherries for the Sudder Ameens and Omlahs.	- - During the last rains the old buildings became too dilapidated for use.	- - Sanctioned 25th March 1846.	Allyghur - -	3,355 13 10	3,003 - -	- - Completed season 1846-47.	—
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—REVENUE:							
Akyab: Additions and Alterations to the Treasury and Record-room.	- - - - - - - -	- - Sanctioned 9th September 1844.	Akyab - - -	1,625 - -	1,625 - -	- - Completed season 1845-46.	- - The works executed consisted of an arcaded pucca verandah in lieu of a thatched one; additional alterations to doors and windows, and renewing the terrace roof.
CIVIL BUILDINGS, CENTRAL PROVINCES—REVENUE:							
Allahabad: Pilgrim Hospital, additions to.	- - - - - - - -	20th December 1839	Allahabad - -	1,475 1 -	1,475 1 -	- - Completed season 1840-41.	—
Office of the Sudr Board of Revenue.	- - Repair of injury done by storms on the 2d and 3d May 1848.	18th October 1838 -	- ditto - - -	8,540 - -	8,540 - -	- - Completed season 1839-40.	—
Construction of four Tehsildarry Cutcherries.	- - - - - - - -	- - Sanctioned 27th August 1840.	- - These cutcherries are situated at Menjah Chail, Kurchunna, and Munjeirpore.	19,812 4 5	20,423 2 4	- - Completed season 1842-43.	—
Azimgurh: Construction of a Tehsildarry Cutcherry.	- - - - - - - -	- - Sanctioned 31st March 1838.	At Cheerkote - -	5,730 - 4¾	- - - -	- - Completed season 1841-42.	—
Allahabad: Construction of a Treasury Room to the late Judges' Cutcherry.	- - This cutcherry has been transferred to the Collector of Allahabad.	- - Sanctioned 27th March 1847.	Allahabad - -	- - - - -	3,869 - -	—	
CIVIL BUILDINGS, NORTH WESTERN PROVINCES—REVENUE:							
Agra: Construction of a Cutcherry for the Commissioner of the Division.	- - - - - - - -	- - Sanctioned 11th August 1846.	Agra - - -	9,561 6 -	10,573 - -	- - Completed season 1846-47.	—
Addition of Outbuildings to the Cutcherry of the Commissioner.	- - Consisting of a guard-house, godown, and shed.	- - The necessity for these works was brought to the notice of the Lieutenant-governor, who at once directed the executive officer to commence on the buildings.	- ditto - -	1,206 5 7	1,533 - 3	- - Completed season 1847-48.	—
Allyghur: Construction of a Tehsildarry Cutcherry at Eglass.	- - The Tehsil duties have been carried on with much inconvenience at the Sudder Station, which is a distance of 15 miles.	- - Sanctioned 7th July 1843.	Eglass - - -	- - - - -	4,092 12 6	—	
CIVIL BUILDINGS, SOUTH EASTERN PROVINCES—GENERAL:							
Akyab: Enclosure of the Burial Ground.	- - - - - - - -	- - Sanctioned 16th May 1842.	- - - -	- - - - -	1,985 12 3	—	
Allipore: Removing and setting up a Steam-engine in the Iron Bridge Yard.	- - This engine, which has been transferred from Chaund Paul Ghaut, is of 10 horse-power.	- - Sanctioned 23d October 1843.	Allipore - - -	7,249 - -	7,020 - -	- - Completed season 1844-45.	—

(continued)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839-40, to 1850-51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—GENERAL—*continued.*							
Allipore—continued.				*Rs. a. p.*	*Rs. a. p.*		
Construction of new buildings.	For the establishment attached to the Mathematical Instrument Department.	Sanctioned 16th January 1844.	Allipore	3,794 12 8	3,794 12 8	Season 1843-44.	—
Akyab; Protection of the Beach, and formation of a Landing-place.	The necessity for this work was brought to notice by the Marine Board and the Commissioner of Arracan.	Sanctioned 19th June 1843.	Akyab	10,120 – 7	13,868 11 2	Completed season 1845-46.	This outlay is to be defrayed from the port dues. The saving on the work is 3,748 rupees, in consequence of 7½ groins having been constructed instead of 10. The pier provided in the sanctioned estimate has not been executed. The above amount has been placed at the disposal of the Commissioner of Arracan for completing the pier or breakwater.
Constructing of a Large Shed with Verandah, to serve as an Exchange.	A place of this description is much wanted at Akyab, where merchants, agents, captains, &c. may assemble under shelter from sun or rain.	Sanctioned 17th November 1845.			1,500 – –	Season 1845-46	The shed is to be 66 by 20, with a verandah 12 feet on four sides.
Construction of Three Marine Wells.		Sanctioned 20th March 1844.		767 3 3		Completed season 1845-46.	—
Allipore; Additions, &c. to the Iron Bridge Yard.	For increasing the accommodation to afford shelter to the carpenters, who at present work in the open air; for English smithy coal, to prevent its wastage from wind and rain; and also to provide sufficient space to meet heavy demands.	Sanctioned 27th May 1846.	Allipore	4,269 2 6	4,199 – –	Season 1848-49.	—
Construction and setting up of an additional boiler to the Steam-engine at the Iron Bridge Yard.	Necessary to secure the efficiency of the establishment and prevent delays, which would prove detrimental to the public service.	Sanctioned 17th May 1845.	ditto	3,289 15 9	3,289 15 9	Constructed season 1846-47.	—
Amherst: Provision of a Pilot Station on the Island off Amherst.		Sanctioned October 1848.	Amherst	487 11 11	500 – –	Reported season 1846-47.	—
CIVIL BUILDINGS, LOWER PROVINCES—GENERAL:							
Akra: Additions to the Semaphoric Tower.		Sanctioned 12th August 1846.	Akra	575 10 1¾		Season 1847-48.	—
CIVIL BUILDINGS, CENTRAL PROVINCES—GENERAL:							
Allahabad: Ghaut on the Jumna, at.		Sanctioned 1839-40.		5,799 12 –	3,500 – –	Completed 1840-41.	The excess over the estimated amount is owing to the execution of the work on a more complete plan than was intended, in accordance with the advice of the magistrate, who had promised aid to the extent of 2,000 rupees towards the undertaking.

Agra: Provision of accommodation for the Establishment with the Governor-general.	- - - - - - -	- - Sanctioned season 1843-44.	Agra - - -	2,611 15 11	- - - -	Season 1843-44.	—
Allahabad:							
Enlargement of the Burial Ground.	- - The ground in the existing cutcherry was completely occupied with graves, and the burial-place required extension.	- - Sanctioned 14th February 1848.	Allahabad - -	529 2 11	564 5 3	- - Completed season 1848-49.	—
Landing-place for Goods and Passengers, and Apparatus for landing Goods, &c.	- - Under a representation from the agent Government steamers of the necessity of the works.	- - Sanctioned 28th December 1849.	Allahabad - - - - - - -		7,108 4 5	- - - -	- - In consequence of the increased influx of stores to be sent per bullock train, the steam agency is not at all times sufficient to contain the whole of the goods in store. With reference to the Ghaut, &c., it is stated that the crews of the vessels work much harder than the Bandarries or Coolies, so that with the aid of the machinery and works provided for in this estimate, it is expected that a Government vessel may be cleared of the largest cargo ever brought to Allahabad in six or eight hours, which at present occupies 1 ½ to two days.
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—GENERAL:							
Agra:							
Enclosure of the new Burial Ground.	- - - - - - -	- - Sanctioned 17th October 1842.	Agra - - -	386 1	- - - -	- - Completed season 1842-43.	—
Construction of a Record Room.	- - For the accountant North-Western Provinces.	- - Sanctioned 6th October 1845.	Agra - - -	2,181 10 10	2,168 - -	- - Completed season 1846-47.	—
Erection of a new Staging Bungalow.	- - In lieu of the present building, which is not suited for the accommodation of travellers.	- - Sanctioned 14th August 1845.	Agra - - -	1,756 5 9	2,102 - -	- - Completed season 1846-47.	—
Construction of a Post Office and Godown, with Compound Wall.	- - At the instance of the Post-master-general.	- - Sanctioned 10th July 1849.	Agra - - - - - - -		5,511 - -	—	
Construction of a Theatre, with Museum attached, as a Wing to the College.	- Under orders of the Lieutenant-governor.	- - Sanctioned 13th July 1850.	Agra - - - - - - -		13,840 8 -	- - - -	- - The grounds for the preparation of this estimate were not made known to the Military Board.
CIVIL BUILDINGS, LOWER PROVINCES—POLITICAL:							
Assam, Upper: Construction of various Buildings at.	- - At Subsaugor: treasury, record room, magazine, with guard room. At Detroghur: record rooms, treasury, powder magazine, store room.	- - Sanctioned 3d August 1840.	Upper Assam - - - - - - -		11,913 9 9	Season 1840-41.	—
CIVIL BUILDINGS, CENTRAL PROVINCES—POLITICAL:							
Ajmere: Construction of Residency Buildings.	- - - - - - -	- - Sanctioned 31st August 1840.	- - - -	1,024 3 5	1,160 15 11	- - Completed season 1841-42.	—
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—POLITICAL:							
Agra: Construction of additional Buildings.	- - For the accommodation of the records of the office of the Secretary to Government.	- - Sanctioned 13th February 1846.	Agra - - -	2,789 9 10	- - - -	- Constructed season 1846-47.	- - The new record room measures 30 by 18 feet, with two side and one end verandah, 10 feet in the clear.

(*continued*)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839-40, to 1850-51 inclusive—*continued*.

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
MARINE BUILDINGS, LOWER PROVINCES:							
Akyab: Construction of a Lighthouse on the Great Savage Rock.	- - - - - - -	- - Sanctioned 9th November 1842.	- - - -	Rs. a. p. Cost of Light-house - 33,587 10 4 Buildings attached - 1,501 9 6 Lantern - 15,000 - - Rs. 50,089 3 10	Rs. a. p. 33,425 8 7 The cost will be defrayed from the funds of the port, which are believed to amount to 20,000 or 30,000 rupees. The lantern to be used, which is valued at about 21,000 rupees, will be supplied from the marine stores in Calcutta.	- - Completed season 1843-44.	- - Thirty-five feet of the rock downwards has been removed, and a base thus obtained for the superstructure. The rock is now 49 ½ feet above high-water mark, and the lighthouse will be raised to the height of 50 ¼ feet, so that it will be 100 feet above the highest spring-tides. The lantern was lighted on the 7th March 1844.
EMBANKMENTS, SOUTH-WESTERN PROVINCES:							
Burdwan Division: Restoration of the Kaunee Khal Bunds.	- - - - - - -	- - Sanctioned 15th July 1841.	Burdwan - -	- - - - -	1,075 12 -	Season 1841-42 -	- - The length of embankments in the Burdwan Division is represented, in 1839-40, to be 285 miles, and the estimated cost of annual repairs, 4,619 rupees.
New Bund on the Adjye River.	- - To prevent injuries to lands by the overflows of the river.	Sanctioned 1841-42	- - - -	1,884 11 -	- - - -	- - Completed season 1841-42.	—
EMBANKMENTS, SOUTH-EASTERN PROVINCES:							
Bogree: Construction of a new Bund on the Selin River.	- - To replace the old bunds, which were pronounced to be quite insusceptible of efficient repair.	- Length, 10,460 feet; sanctioned season 1843-44.	Bogree Pergunnah -	2,437 14 1	- - - -	- - Completed season 1843-44.	- - It is expected that about 844 beegahs of land will be fertilised.
Burdwan: Construction of a new line of Bund from Salalpore to the Canna Nuddee, and repairs and renewals to the Burdwan Bunds generally.	- - The new bund is proposed for construction at a point where the old one has frequently failed, causing great damage to the country.	- Length of new bund, four miles; sanctioned season 1847-48-49.	Burdwan - -	- - - - -	72,176 12 9 16,469 - - 88,645 12 9	—	
Burdwan Bunds: Repair of a breach at the Raguhpore Bund.	- - This bund was breached during the floods of 1848, nearly opposite to Burdwan, at a point where the whole force of the Damoodah acts upon it.	- - Sanctioned season 1848-49.	Near Burdwan -	7,291 7 10	- - - -	Completed 1849 -	- - The length of the new dobundy is 11,600 feet; the centre has an average height of 16 feet; it is 14 feet broad, and has slopes of four to one and three to one. The ends, which are not exposed to the force of the river, 9,100 feet in length, have a height of 10 feet, and a crest of 8 feet.
Balasore Division: Construction of new Bunds, and restoration of others which had been abandoned.	- - Required for the protection of the estate Mouzah Sindeeah, Pergunnah Soonhut.	- Sanctioned January 1844.	- - - -	- -	230 - -	Season 1843-44 -	- - The average length of embankments in 1839-40, in the Balasore Division, was estimated at 185 miles, and the cost of annual repairs, 1,665 rupees. In 1847-48, the estimate for annual repairs was *Rs.* 7,097. 13. 9.

Berhampore Division: Bunds at Moorshedabad.	- - - - - - -	- - Length, about 74 miles.	- - - - -	- - - - - -	- - - - -	- - - - -	- - The cost of annual repairs for 1850-51, amounted to 4,724 rupees.
Banleah Bunds: New Bund from Huntanabad to Banleah Ghaut.	For the protection of the town -	- - Length two miles, one furlong, and 180 yards, sanctioned 6th February 1840; 3,100 feet additional sanctioned December 1840	- - - -	- - - - -	4,111 - -	- - This work is in progress.	—
		- - - -	64 8 1¼		1,337 - -	- - Completed 1841-42.	- - *Rs.* 1,272. 14. 1¼. less than the original estimate, owing to the employment of convicts on the work.
Buxee Bund: Construction of a Sluice Bridge at the western end of this Bund.	- - To prevent influx of the waters of the Ganges.	- - Sanctioned 22d February 1850.	- - At the village of Chooter Bogree, Allahabad.	- - - - -	2,223 10 3	- - - -	- - The west end of the Bund was totally detached from the high ground, with which it ought to be connected, and the waters of the Ganges run up a hollow many hundred feet in rear of the left flank of the Bund.
EMBANKMENTS, CENTRAL PROVINCES:							
Behar, Sacri Bund: Reconstruction of.	- - To protect the country on the Western Channel from inundations.	- - Sanctioned season 1838-39.	Behar - - -	12,218 - - Estimate for ordinary repairs, 1,500 rupees.	9,155 2 7	Completed 1840-41	- - The great excess of expenditure beyond the estimate, was occasioned by Lieutenant Ommaney not making a sufficient allowance, for the great distance from which the earth had to be brought. The bund has fully answered the purposes for which it has been reconstructed, and the collector anticipates no difficulty in realising from the Zemindars the amount expended.
CANALS, NORTH-WESTERN PROVINCES:							
Becjapore: Watercourse in the Deyrah Dhoon.	- - For the irrigation of land lying between the Tonse, the Arson, and Bogul Rivers.	Sanctioned 1838-39	Deyrah Dhoon -	15,926 14 7	- - - -	Completed 1840-41	—
Construction of masonry falls	- - To lessen the rapidity of the stream.	Sanctioned 1838-39	- - - -	6,364 2 4	- - - -	- - Completed 1841-42.	—
Brotana Branch Canal: Construction of 50 masonry outlets.	For irrigation - - - -	- - Sanctioned 7th March 1837.	- - - -	4,501 1 4	- - - -	- - Completed season 1842-43.	—
Becjapore Watercourse: Construction of a masonry Tunnel.	In lieu of a wooden tunnel - -	- - Sanctioned 26th September 1843.	- - Near the village of Dakra.	2,996 14 -	2,996 14 -	- - Completed season 1843-44.	- - The wooden tunnel was a source of much trouble and expense, owing to the repairs which it required constantly.
Construction of a Corn Mill at Dakra.	- - - - - -	- - Sanctioned 1st June 1844.	- ditto - -	682 12 3	--		
CANALS, SOUTH-WESTERN PROVINCES:							
Canal from the Banka Nullah to the New Pertaubkhollee Canal in Tumlook.	- - The Banka Nullah Canal forms a navigable communication between the Huldee and Roopnerain River, and is chiefly used for the transport of salt. By the new cut the dangerous route taken by the salt boats of Tangrakhally and Roopnerain Rivers will be avoided.	- - Length of the new cut 8 miles and 145 feet; sanctioned 24th November 1841.	- - - -	- - This project was abandoned under orders of Government, 17 August 1842.	- - Estimated for the new cut, 17,619 2 -	- - - -	- - Further inquiry established the fact, that there are no sufficient grounds for entertaining the expectation that it will be possible to locate 300 or 400 Khalines along the sides or in the vicinity of the proposed canal, and that the risk attending the transport of the Ourung salt to Ghat Narampore, as now conducted, ought, with proper precautions, to be quite inconsiderable.

(*continued*)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CANALS, SOUTH-WESTERN PROVINCES—*continued.*							
Baliaghatta Canal - - -	- - - - - - - -	- - Sanctioned 13th December 1839.	- - - -	*Rs. a. p.* 1,611 4 – Sanctioned, for strengthening the south bank by piling.	*Rs. a. p.* - - - -	- - Completed season 1843–44.	—
Baliaghatta Canal, repair of a portion of the south bank.	- - To obtain a wider road, and improve the slopes of the bund.	- - Sanctioned season 1849–50.	- - - -	508 13 7½	- - - -	- - Completed season 1849–50.	- - The dock gates were taken out and repaired at a cost of *Rs.* 457. 2. 6.
ROADS AND BRIDGES, SOUTH-EASTERN PROVINCES:							
Construction of a Bridge on the Burdwan and Hooghly Road, at Shaickpore.	- - This bridge is required on a part of the road which is liable to be cut through, whenever the floods of the Damoodah Nullah are brought down the Banka Nullah from the neighbourhood of Burdwan.	- - Sanctioned 22d December 1840.	- - - -	1,588 9 5	1,681 1 10	- - Completed season 1842–43.	- - This is to be a bridge of three (3) arches.
Bancoora and Burdwan Road -	- - A portion of the old line of road bordering on the southern bank of the Damoodah Rivers, by the floods of which it is constantly breached, is to be abandoned, and a more direct one adopted.	- - Length 14½ miles; sanctioned 16th February 1841 and 19th May 1842.	- - - -	- - Cost of the bridges, 7,890 rupees.	12,000 – – and 8,880 14 3	- - Completed season 1846–47.	- - The number of drains and bridges to be constructed, amounts to 34. The road is under charge of the Burdwan Local Committee.
Bissenpore Road:							
Construction of a new masonry Bridge on the.	- - Indispensable for the safety of the Bissenpore road, of which, owing to insufficiency of drainage, 2,000 feet were carried away by a flood.	- - Sanctioned 28th August 1843; to consist of two arches of 16 feet span each.	Near Gobroo Bazar -	2,120 1 – ¾	2,438 2 10	- - Completed season 1844–45.	- - This is an important line of communication, as it connects the grand trunk road with Midnapore and the Province of Orissa.
Construction of a masonry Bridge over the Doodiah Khall.	- - To supply the place of an old bridge, which was destroyed by inundation.	- - Of four arches, 20 feet span each; sanctioned 26th March 1845.	- - Between Midnapore and Bissenpore.	7,449 – –	8,646 4 –	- - Completed season 1847–48.	—
Boringham: Construction of two additional Arches to the masonry Bridge at.	- - This bridge was severely injured by the overflowing of the river in September 1843. It is hoped that these arches will reduce the elevation of the waters in some degree, and thus lessen the evil to be feared by the error in construction of not having raised the pier to a sufficient height.	- - Sanctioned 29th June 1844.	- - On the Raepore mail road, in the Nagpore territory.	4,945 13 –	4,945 13 –	- - Completed season 1846–47.	The bridge consisted of three arches.

Ballu Khal Iron Tension Bridge: Construction of	A bridge at the spot selected will be a great public convenience.	One span of 250 feet, with a 16 feet roadway, sanctioned 3d June 1844.	Situated on the right bank of the Hooghly River, near Howrah, opposite Calcutta.	56,680 4 2	48,447 9 –	Completed in 1845	The inhabitants subscribed 17,800 rupees towards its erection; the requisite disbursement for completing the structure was to be made from the ferry funds of the district. This bridge fell down in June 1845, immediately after its completion, which was attributed to a want of sufficient strength in the central connexion of the chains. The bridge was again put up, greatly strengthened in the central connexion. The Court, in a despatch dated 3d December (No. 9) 1845, disapproved the tension principle, and directed that it should not be further adopted in the construction of suspension bridges.
Restitution of the		Sanctioned 28th October 1845.		12,927 9 8	7,431 – –	Reconstructed season 1846–47.	—
Making the approaches to the		Sanctioned 16th March 1846.			2,445 9 7	—	
Bissenpore Road: Strengthening of the Tamaul Nullah and Sautbancoorah Masonry Bridges.	In consequence of injuries sustained by the floods of season 1844.	Sanctioned 27th August 1845.	Situated in the Midnapore Division.	2,172 1 –	3,572 – –	Completed season 1847–48.	—
Bankipore to Jehannah: Reconstruction of a Bridge and two small Drains.	These works were carried away by a high flood on the 22d August 1844.	Sanctioned 7th May 1845.			1,901 10 1 and 10,000 for drainage.	—	
Behar District: Construction of Drain Bridges on the line of the Grand Trunk Road.	For the drainage of the road	Sanctioned 30th April 1845.		8,177 13 4	8,177 13 4	Constructed season 1846–47.	—
Budge-Budge Road: Construction of four Drain Bridges, and repairs thereon.	With a view to render the road more practicable for mail-carts.	Sanctioned 24th December 1845.		2,440 – 9	2,440 – 9	Season 1845–46.	—
Bissenpore Road: Repair of the Masonry Bridge over the Tamal Nullah.		Sanctioned 9th May 1847.			1,219 15 1	—	
ROADS AND BRIDGES, LOWER PROVINCES:							
Beyalal to Diamond Harbour: Repairs to the Pucka Road and Bridges on.		Length, 24 miles; width, 14 feet; sanctioned 28th July 1845.	Diamond Harbour	35,000 – –	35,000 – –	Completed season 1845–46.	The estimate for annual repairs to the pucca centre of this road amounts to 3,991 rupees.
Barripore to Calpee: Construction of a Cutcha Road.		Length, 32 miles; sanctioned in 1844.	Calpee	19,948 6 6		Completed season 1847–48.	—
Burgatchy to Dinagepore: Raising of the Road.	This line was adopted in lieu of the old road *viâ* Malda, when the settlement at Darjeeling was first formed.	Length, 91 miles and 71 yards; sanctioned 20th October 1847.	Dinagepore	15,224 6 6	16,010 2 9	Completed season 1849–50.	A portion of this road, a distance of 60 miles, has been raised above the level of inundation mark.

(continued)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
ROADS AND BRIDGES, NORTH-WESTERN PROVINCES:				*Rs. a. p.*	*Rs. a. p.*		
Bridge over the Bargool River on the Peelibheet Road, in the district of Rohilcund.	- - - - - - - -	- - Sanctioned in season 1839–40.	- - - -	11,298 3 3¾	9,158 8 –	- - Completed season 1841–42.	- - The excess, *Rs.* 2,139. 11. 3., of expenditure beyond the estimate is owing to the difficulties encountered in the execution of the work, and to convict aid to the extent contemplated not having been afforded.
CIVIL BUILDINGS, LOWER PROVINCES—JUDICIAL:							
Baraset Gaol: Rebuilding of the Compound Wall.	- - The former wall was pulled down when the alterations to the gaol, for the receptions of the followers of the Ameers of Scinde, were undertaken.	- - Sanctioned 18th July 1844.	- - - -	1,057 9 2¾	- - - -	- - Completed season 1844–45.	- - Government subsequently decided on sending the ex-Ameers to Hazareebaugh.
CIVIL BUILDINGS, SOUTH-WESTERN PROVINCES—JUDICIAL:							
Balasore Gaol: Construction of additional Wards.	- - Owing to the insufficiency of accommodation.	- - Sanctioned season 1839–40.	Balasore - - -	4,740 – –	4,605 – –	- - Completed season 1841–42.	—
Improvements to the drainage of.	- - - - - - - -	- - Sanctioned season 1841–42.	- - - -	1,095 2 1	- - - -	- - Completed season 1841–42.	—
CIVIL BUILDINGS, LOWER PROVINCES—JUDICIAL:							
Bauleah Gaol: Additions to, and Drainage.	- - To provide for better ventilation, &c.	- - Length of drain, 361 feet.	Bauleah - - -	8,027 8 9	7,726 – – for additions.	- - Completed season 1840–41.	—
Behar: Construction of an additional Record-room.	- - For the records of the office of the Judge.	- - Sanctioned 11th September 1843.	Behar - - -	1,239 3 –	1,239 3 –	Season 1843–44 -	- - The necessity for this additional accommodation was brought to notice by the Sudder Dewanny Adawlut.
Burnagore: Construction of a small Gaol, with Out-offices.	- - For the prisoners employed at Burnagore.	- - Sanctioned 12th December 1845.	Burnagore - -	1,396 – –	1,396 – –	Season 1846–47.	—
Baraset Gaol: Additions and alterations to.	- - To render it secure as a place of confinement.	- - Sanctioned 20th April 1846.	Baraset - - -	7,184 14 4½	6,945 – –	- - Completed season 1847–48.	- - The contemplated works are the substitution of iron for the wood work of the windows, &c., and raising the surrounding wall from nine to 13 feet.
Bauleah: Addition of a Verandah to the Principal and two Sudder Ameens' Cutcherries.	- - In consequence of the crowded state of these cutcherries, and also with a view to make the buildings more comfortable.	- - Sanctioned 9th September 1846.	Bauleah - - -	1,817 1 –	1,959 2 8	- - Completed season 1847–48.	- - The lowness of the wall, only 12 feet 6 inches below the beams, rendered them exceedingly close and hot.
Baraset: Construction of a new Pucca Stable to the Joint Magistrate's Cutcherry.	- - Undertaken under a representation of the joint magistrate.	- - Sanctioned 7th May 1849.	Baraset - - -	- - - - -	575 3 7	- - Completed season 1849–50.	- - The roof of stabling will be thatched.
Bauleah: Construction of a Cutcherry for the Sessions Judge, &c.	- - The additional accommodation to be provided was urgently needed.	- - Sanctioned 5th September 1850.	Bauleah - - -	- - - - -	15,388 9 1	- - - -	- - The construction of the new building will enable the Government to give a building which has been rented at 100 rupees per mensem.

CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—JUDICIAL:

Bareilly Gaol: Construction of two experimental Wards.	- - - - - - -	- - Sanctioned 7th October 1842.	Bareilly - - -	11,170 9 1¾ 10,000 rupees have been paid for the site of the building.	12,436 5 8	- - Completed season 1842–43.	—
Construction of additional Public Buildings.	- - For a mill-house, guard-room, and cook-room.	- - Sanctioned 17th February 1843.	Bareilly - - -	2,143 4 10	2,355 10 –	- - Completed season 1844–45.	—
Budaon Gaol - - -	- - - - - - -	Sanctioned 1838–39	Budaon - - -	13,981 – – And *Rs.* 469. 8. 4. for draining.	- - - -	- - Completed season 1844–45.	- - This gaol consists merely of an enclosure wall, a hospital, guard-room, sentry-boxes, and wells. The convicts to build their own huts.
Bareilly: Construction of a Thowalat, at.	- - For the accommodation of prisoners under trial.	- - Sanctioned 15th November 1851.	- - - -	- - - - -	2,634 5 –	—	
Boolundshuher Gaol: Alterations to.	- - For the improvement of the prison discipline, and for two separate rooms for juvenile offenders.	- - Sanctioned 16th December 1842.	- - - -	602 10 8	1,433 4 4	- - Completed season 1843–44.	- - Two rooms for juvenile offenders have been constructed; the rest of the improvements estimated for were not considered absolutely necessary.
Bowannah: Construction of Tuhsildarry Cutcherry, at.	- - The old cutcherry was in ruins, and inconveniently situated.	- - Sanctioned 22d November 1842.	- - - -	5,641 3 1	5,641 3 1	- - Completed season 1842–43.	—
Bhandaree: Construction of Police Guards and Gaols.	For prisoners under trial - -	- - Sanctioned 27th April 1844.	- - In the districts of Kutchwagur and Bhandaree.	2,200 – –	2 200 – –	Season 1844–45.	—
Bolundshuher Gaol: Construction of Out-buildings and Cook-rooms.	- - - - - - -	- - Sanctioned 20th August 1844.	Boolundshuher -	1,601 1 1	1,600 5 1	- - Completed season 1844–45.	—
Bhutteeana: Cutcherry for the Superintendent.	- - For the accommodation of the superintendent English officer, Post Office.	- - Sanctioned 1st October 1849.	Bhutteeana - -	3,000 – –	- - - -	Season 1849–50 -	- - This building was purchased from the estate of Lieutenant Mackeson at Sirsa.

CIVIL BUILDINGS, CENTRAL PROVINCES—JUDICIAL:

Benares: Additions and Alterations to the Insane Hospital.	- - For the better classification and custody of the insanes, two of whom lost their lives from the want of means of separating the harmless from the violent.	- - Sanctioned 26th February 1845.	Benares - - -	5,459 6 6	6,173 7 4	Season 1848–49 -	- - In the contemplated alterations part of the compound wall will be taken down, and 29 suitable and commodious cells will be built. Provision has also been made for improving the drainage.
Bedur Gaol: Alterations, &c. -	- - For security of the prisoners, and ventilation of the gaol.	- - Sanctioned 9th May 1843.	Bedur - - -	714 14 2	714 14 2	Season 1843–44.	—
Bandah Gaol: Construction of a Pucca Well.	- - Required to replace an old one, which has failed.	- - Sanctioned 18th August 1846.	Bandah - - -	- - - - -	1,804 1 –	—	
Baitool: Construction of a Pucca Gaol.	- - To replace the gaol constructed by the civil authorities, which was reported to be in a defective state.	- - Sanctioned 29th December 1846.	Baitool - - -	22,582 4 11	26,849 – –	- - Completed season 1850-51.	- - The new gaol was to consist of two ranges, one 160 by 20, and the other 145 by 20; each range being divided into four wards, with hospital houses for native doctor, dispensary, and out offices; the station of Baitool has been transferred to the Madras Presidency.

(*continued*)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CIVIL BUILDINGS, CENTRAL PROVINCES—JUDICIAL—*continued.*				*Rs. a. p.*	*Rs. a. p.*		
Bandah: Construction of a new Cutcherry for the Collector.	The cutcherry is at present held in a hired building in Cantonment, but it is required to be given up to the military.	Sanctioned 3d April 1847.	Baitool	14,709 11 6	7,164 – –	Completed season 1848–49.	This cutcherry has been made of permanent materials on a revised plan.
Benares: Construction of a well outside the Gaol Compound.	The only well outside the gaol which supplied water to the establishment of the Burkundauzes had fallen in.	Sanctioned 17th June 1847.	Benares	830 4 9	571 5 9	Completed season 1847–48.	—
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—JUDICIAL:							
Burrisaul:							
Cutcherry for the Magistrate and Registrar.	To replace the cutcherry destroyed by fire in February 1838.	Sanctioned 15th January 1839.	Burrisaul	7,052 4 7	– – – –	Completed 1840–41.	—
New Cutcherry for the Principal Sudder Ameen.	This was rendered necessary in consequence of the existing cutcherry being far removed from that of the Judge, and thus occasioning much inconvenience to suitors and pleaders.	Sanctioned 16th November 1841.	ditto	2,695 13 11	2,894 15 3	Completed 1843–44.	The old cutcherry has been made over to the local committee of public instruction at Burrisaul, to be used as a school-house.
Piling of the bank of the River	In consequence of an encroachment of the Burrisaul River on the town.	Sanctioned 12th March 1842.	ditto	2,330 9 10	2,664 6 –	Completed season 1843–44.	The labour will be performed by convicts. These measures proved a failure. The executive officer submitted a project for the purpose of turning the current of the river, which, in execution, would cost about 1,00,000 rupees; the Government declined to sanction the work, deeming it inexpedient to incur further expense.
Bograh: Construction of a new Circuit Bungalow, with Out-offices.	– – – – – – –	Sanctioned 20th November 1844.	– – – –	4,682 14 7	4,999 5 –	Completed season 1846–47.	—
Burrisaul: Construction of a new Circuit House and Out-offices.	On the requisition of the Commissioner of Dacca, who represented that there was no circuit house for his accommodation, as well as that of his office, and that the transfer of a large section of the Soonderbunds to the Collector's jurisdiction, demanded that a great portion of his time should be devoted to the affairs of this collectorate.	Sanctioned 16th December 1846.	Burrisaul	5,446 10 2	– – – –	Completed season 1850–51.	—

Burrisaul Gaol: Construction of four Solitary Cells, and Drainage of.	The necessity for these works was originally brought to the notice of Government by the local civil authorities.	Sanctioned 28th December 1846.	Burrisaul	1,718 1 3	1,843 15 11	Completed season 1849–50.	—
Burdwan Gaol Hospital: Construction of an additional Ward.	- - - - - - -	Sanctioned 24th November 1847.	Burdwan	- - - - -	1,000 - -	- - - -	To be constructed by the convicts, under the immediate superintendence of the magistrate, assisted in respect of plans by the executive officer of the division.
CIVIL BUILDINGS, LOWER PROVINCES—REVENUE:							
Bhaugulpore: Additions to the Collector's Cutcherry.	On a representation from the Collector to the Commissioner of the great inconvenience felt from the small size of the cutcherry.	Sanctioned 11th August 1847.	Bhaugulpore	3,199 5 8¾	3,269 4 9½	Completed season 1849–50.	—
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—REVENUE:							
Burrisaul: Additions to the Collector's Cutcherry.	Required on account of the crowded state of the record-room, and also for the accommodation of two deputy collectors, recently added to the collectorate of Backergunge.	Sanctioned 26th November 1845.	Burrisaul	5,848 14 10	6,533 - -	Completed season 1847–48.	—
CIVIL BUILDINGS, CENTRAL PROVINCES—REVENUE:							
Bundlecund: Enclosure of the Tuhsildarry Cutcherry at Koonch	In consequence of an attempt made to plunder the treasury.	Sanctioned 29th March 1842.	Koonch	1,173 4 4	1,441 3 11	Completed season 1842–43.	—
Benares: Construction of a Verandah to the Collector's Cutcherry.	The necessity of this work was brought to the notice of Government by the local civil authorities. These verandahs will make the cutcherries cooler, and afford greater facilities for putting up tatties during the hot season in the upper rooms.	Sanctioned 26th April 1846.	Benares	1,683 2 11	1,683 2 11	Completed season 1846-47.	—
Banda: Construction of an additional Record-room.	For the use of the Collector's office.	Sanctioned 14th August 1849.	Banda	- - - - -	6,697 - -	—	
CIVIL BUILDINGS, LOWER PROVINCES—GENERAL:							
Bulloah: New Salt Cutcherry	For the use of the Salt agent	Sanctioned 1839–40	At Noacolly	2,646 - -	- - - -	Completed 1839–40.	The former building was altogether unfit for the purpose, for want of sufficient accommodation, and from the dampness of the floors.
Barrackpore, Government House: Construction of new Out-houses.	- - - - - -	Sanctioned 4th November 1840.	- - - -	4,646 4 3¾	- - - -	Constructed 1840–41.	—
Bagundee: Construction of a New Guard-house.	For the Sepoy guard	Sanctioned 3d January 1841.	- - - -	502 11 1	543 2	Completed 1841–42.	Great sickness and mortality occurred in the Sepoy guard, which, in the general opinion of the officers as well as of the civil surgeon, was owing to the proximity of the old guard-room to the Salt godowns.

(*continued*)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839-40, to 1850-51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CIVIL BUILDINGS, LOWER PROVINCES—GENERAL—*continued.*				*Rs. a. p.*	*Rs. a. p.*		
Barrackpore: Enlargement of the Burial-ground.	The extension is urgently required.	Sanctioned 6th September 1844.	Barrackpore	1,044 10 5	1,025 7 8	Completed season 1845-46.	The additional space to be included measures 380 × 100 feet.
Conversion of a Building in the Park into an Aviary.		Sanctioned season 1845-46.		7,558 13 4	7,558 13 4	Completed season 1845-46.	—
Bauleah: Construction of a Post-office.	This is a pucca building	Sanctioned 10th February 1847.	Bauleah	1,169 7 11½	1,226 11 1	Completed 1847-48.	—
Bhaugulpore: Repair of the Mausoleum of Mirza Abraham Hoossien.		Sanctioned 6th October 1848.	Bhaugulpore	355 10 10½	355 10 10½	Season 1849-50.	—
Bauleah: Construction of a School-house.		Sanctioned 1st August 1850.	Bauleah	6,336 11 11		Constructed in season 1850-51.	This building measures 81 feet by 61 feet, and is intended to contain 200 children.
CIVIL BUILDINGS, CENTRAL PROVINCES—GENERAL:							
Busar Chapel; Repair of the, and construction of a Verandah.		Sanctioned season 1846-47.	Situated midway between the fort and the buildings occupied by invalids.	1,714 8 11	1,874 11 2	Completed 1847-48	This chapel was assigned over to Government by the Missionary Society; it measures 40 feet by 20 feet (interior dimensions).
Benares: Construction of an additional Godown.	To extend the accommodation of the opium factory premises.	Sanctioned 17th February 1847.	Benares	4,317 — —	3,917 — — A further sum of 400 rupees sanctioned for alterations to the boundary-wall of the factory.	Season 1847-48.	—
CIVIL BUILDINGS, LOWER PROVINCES—ECCLESIASTICAL:							
Barrackpore Church: Construction of a Wall.	To enclose the church	Sanctioned 9th October 1839.	Barrackpore		1,100 10 7	Season 1839-40.	—
EMBANKMENTS, SOUTH-WESTERN PROVINCES:							
Culmeejole Division		Length, 426 miles; estimated cost of annual repairs, 1839-40, *Rs.* 18,323. 9.					The average cost of annual repairs in the Culmeejole Division was, in 1850-51— To Government bunds, including sluices and inspection bungalows — *Rs. a. p.* 24,628 6 10; Zemindarry — 12,334 8 6; *Rs.* 36,962 15 4
Cuttack		Length, 560 miles					The cost of repairs to the embankments in the Cuttack Division, in 1847-48, was *Rs.* 22,322. 14. 7. In Report 1840-41, para. 19, it is stated that in Central Cuttack alone, during the last 10 years, 11,09,427 rupees have been remitted on account of loss from drought and inundations. A report was received in 1850 on the protective works undertaken as a temporary measure for the safety of the Cuttack Revetment, from which it appeared, that, notwithstanding the occurrence of unusually high floods in the Kutjoree river, the revetment has stood well without sustaining the slightest injury. These works have had the effect of giving the current a favourable direction, by which the station and town of Cuttack have, in all probability, been saved from destruction.

ROADS AND BRIDGES, SOUTH-EASTERN PROVINCES:						
Construction of Wooden Bridges on the Road between Chittagong and the Fenny River in Arracan.	- - - - - - - -	- - - - -	- - - - -	- - - - -	3,625 6 8	- - - - - - The executive engineer will consider the future maintenance of this road as part of his ordinary duty.
Culna Road: Repair of - - - -	- - - - - - - -	- - Length, 35 ½ miles; sanctioned 1841–42.	- - From Burdwan to the Hooghly River.	3,282 12 10 And *Rs.* 1,282. 1. 10. for drain bridges.	- - - -	Completed 1841-42 - - - The expenses will be paid by the Rajah of Burdwan.
Metalling of the - - -	- - - - - - - -	- - Sanctioned 6th June 1844.	- - Ditto - -	12,419 - -	11,937 6 3	- - Completed season 1846–47. —
Chittagong: Construction of a Drain Bridge	- - In the place of a bridge destroyed in the rains of 1843.	- - Sanctioned 15th January 1845.	- - - - -	333 11 10	- - - - -	- - Constructed season 1845–46. —
Construction of Ramps in the Nullahs on the Chittagong Road.	- - These ramps are intended for the passage of cattle, with a view to the preservation of the wooden bridges.	- - Sanctioned 28th January 1846.	- - Between Chittagong and the Big Fenny River.	1,165 4 -	1,521 - -	- - Constructed season 1846–47. - - A large trade in cattle is carried on between Arracan and the Bengal districts to the north; and it has been ascertained that so many as 8,000 have passed down the road in one month.
Calcutta to Barrackpore: Repair of the road.	- - - - - - - -	- - Sanctioned 2d September 1845.	- - From Shambazur Bridge to Pettah Ghaut.	- - - - -	57,713 15 11 ½	- - - - - - The road is to be repaired with three-inch gooting.
Chittagong City: Construction of a Bridge.	- - In lieu of a bridge destroyed by inundation during the rains of 1841.	- - Sanctioned 31st March 1847.	Chittagong - -	- - - - -	1,551 - -	- - - - - - The new bridge will be of two segmental arches of 10 feet span, each versed 1 ⅓ of span.
Chittagong: Road to the Big Fenny River.	- - Additional flooring to six masonry bridges, to prevent their destruction by undermining.	- - Sanctioned 11th January 1848.	Big Fenny River -	1,212 9 10	1,260 8 7	—
Chittagong and Daood Kandy Road: Improvements by making Slopes.	- - The present road is cutcha, which renders it necessary that a distinct space be allotted as a berme, to serve both as a base to the slopes intervening between them and the side open drain, and as a prevention to encroachment.	- - Sanctioned 19th February 1850.	- - - -	- - - - -	78,281 13 11	- - - - - - This estimate was called for by Government on a recommendation from the Military Board of the necessity of the work.
ROADS AND BRIDGES, LOWER PROVINCES:						
Chupprah to Mootearee -	- - As a means of communication with the new civil station, established in Chumparum in 1837.	- - Length, 61 miles; estimated for in August 1839.	- - Mootearee, in Chumparum.	- - - - -	47,286 7 4	- - Its completion not reported. —
Chupprah to Rewah Ghaut -	- - - - - - - -	- - Length, 22 ⅛ miles; estimate dated 4th June 1839.	- - - -	7,448 1 9	8,602 5 7	Season 1841-42. —

(*continued*)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
ROADS AND BRIDGES, LOWER PROVINCES—*continued.*				*Rs. a. p.*	*Rs. a. p.*		
Colmere Ghaut to Buxar: Construction of Bridges and Drains.	- - For keeping open the communication between Ghazeepore and Dinapore.	- - - - -	Buxar - - -	- - - - -	67,783 8 8	Not reported - -	- - This road, though it forms part of the communication by land between the military station of Ghazeepore and Dinapore, is no great military thoroughfare, the communication between them being always open by water; it is, however, of importance to the traffic of one of the richest and most populous districts in India, and should be kept up, if possible, from local resources.
Cachar to Munnipore - -	- - To make the communication between the eastern frontier and the Burmese country comparatively easy.	- - Length, about 93 miles; commenced in 1837.	Paiksandy, in Cachar	About 39,947 10 4	- - - -	- - Completed season 1842-43.	—
Chota Nagpore: Bridge over the Nullah at Dorundah.	- - For keeping up the communication in the rainy season between the military and civil stations at Dorundah.	- - Sanctioned 2d May 1842.	Dorundah - -	1,406 18 11	1,406 18 11	Season 1842–43.	—
Comillah Road: Construction of 16 new Jungle Wood Bridges.	- - - - - - -	- - Sanctioned 8th July 1844.	- - Situated between Comillah and the Big Fenny.	- - - - -	886 3 6	Season 1844–45.	—
Cossyah Hills to Assam: Repair of the Road and Bridges over the.	- - - - - - -	- - Length, 85 miles; sanctioned 13th November 1844.	- - From Purreeya Ghaut to Paneegong, in Assam.	4,569 - -	4,845 11 6	- - Completed season 1846–47.	—
Circular Canal: Construction of a Pucca Road along the eastern bank of the Circular Canal.	- - With a view to facilitate the communication with the Government new rum distillery.	- - Sanctioned 17th April 1850.	- - Situated between the Manicktollah and Ultadanga suspension bridges.	- - - - -	1,883 9 6	- - - -	- - This work was undertaken in furtherance of the strong recommendation of the civil officers, as well as of the Board of Customs, Salt, and Opium.
Construction of Iron Suspension Bridges over the Boga and Budnapee Torrents.	- - - - - - -	- - East Bridge, six feet in width; sanctioned 10th July 1839.	Cossya Hills - -	14,657 11 1½	14,827 14 4	- - - -	- - Although the bridges are defective in some points of construction, they are believed to be, in all essential respects, substantial and suitable. The Bogapanee bridge has one span of 94 feet between the points of suspension, with suspended approaches, one of which is 28 and the other 30 feet long; and the Burpanee consists of two spans, one of 88 feet, and the other 65 feet between the points of suspension.
ROADS AND BRIDGES, CENTRAL PROVINCES:							
Chunar to Sookroot, in the Mirzapore District.	To supersede the old road - -	- - Length, about 19 miles; estimated in September 1839.	Sookroot - - -	6,998 7 9	6,325 - -	- - Completed season 1841-42.	—

CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—JUDICIAL:							
Chunderee: Construction of a small Gaol and Cutcherry Bungalow.	- - - - - - -	- - Sanctioned 4th January 1845.	Chunderee - -	600 - -	600 - -	- - Constructed season 1844–45.	—
CIVIL BUILDINGS, SOUTH-WESTERN PROVINCES—JUDICIAL:							
Calcutta House of Correction: Construction of Solitary Cells at the.	- - Twenty-four cells have been constructed, with improved accommodation for prisoners.	- - - - -	Calcutta - - -	9,586 3 10	- - - -	Completed 1839–40 -	- - The cost has been defrayed from funds realised by the prisoners' labour. The chief magistrate considers the cells to have answered their intended object so well, that the construction of 24 additional ones is contemplated.
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—JUDICIAL:							
Cuttack Gaol Hospital: Construction of three Wards.	For insane patients - - -	- Sanctioned 23d July 1840.	Cuttack - - -	646 12 2	495 2 -	- - Completed season 1840–41.	—
Commillah: New Court Room for the Magistrate.	- - - - - - -	- - Sanctioned 5th November 1840.	Commillah - -	2,426 1 7	3,307 2 8	Completed 1841–42 -	- - This work was completed for a sum of *Rs.* 881. 1. 1. less than the estimated cost, owing to the labour having been done by convicts.
Calcutta Penitentiary: Construction of six Wards -	- - - - - - -	Season 1841-42 -	- - - - -	30,800 - 7	32,900 8 9	- - Completed season 1842–43.	—
Alterations and additions to -	- - In consequence of defects having been discovered, whereby the security of the prisoners was compromised.	- Sanctioned 10th May 1843.	- - - -	2,296 15 8	2,296 15 8	- - Completed season 1844–45.	—
Calcutta Aqueducts: Setting up a Steam-engine, and alterations and enlargement of the Aqueducts, from the Reservoir at Chundpaul Ghaut to the south-west corner of Esplanade-row East.	- - To raise water for filling the aqueducts, the enlargement of the aqueducts was rendered necessary, consequent on the enlarged supply of water to be expected from the substitution of a 20 for a 10-horse power engine.	- - Sanctioned 6th January 1841.	Calcutta - - -	- - Cost of setting up the engine, *Rs.* 11,074. 12. 7. Cost of new aqueduct, *Rs.* 8,194. 8. 6.	- For setting up the engine, *Rs.* 11,074. 12. 7. - - For enlarging the aqueduct, *Rs.* 9,863. 11. 3.	- - Completed season 1842–43. - - Completed season 1845–46.	- - The engine, which is of 20-horse power, is valued at *Rs.* 11,008. 12. 11 ¾., and was sent to India in 1828–29 with the saw-mill machinery; it is now transferred from the Arsenal of Fort William.
Calcutta Police Hospital: Construction of two additional Wards.	- - For the sick poor of the town, and as a place for the resort of the poor from the neighbouring district for surgical operations.	Sanctioned 1841–42 -	Ditto - - -	1,317 2 -	1,317 2 -	Season 1841–42.	—
Construction of a tiled Shed at the Sudder Dewanny.	- - For the convenience of vakeels and others who attend the Court.	- - Sanctioned 19th September 1842.	Ditto - - -	1,340 4 9	1,358 5 3	- - Completed season 1843–44.	—
Calcutta Penitentiary: Construction of six Wards -	- - For civil and criminal Supreme Court prisoners.	- - Sanctioned 16th June 1841.	Ditto - - -	30,800 - 7	32,900 8 9	- - Completed season 1842–43.	—
Construction of a new steam-engine house.	- - For a 20-horse power engine, transferred from the Arsenal of Fort William to the town of Calcutta.	- Sanctioned 7th September 1841.	- - Situated at the Chaund Paul Ghaut.	11,074 12 7	11,074 12 7	- - Completed season 1842–43.	—

(*continued*)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839-40, to 1850-51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—JUDICIAL—*continued.*							
Calcutta Penitentiary—continued.				*Rs. a. p.*	*Rs. a. p.*		
Construction of other works connected therewith.	- - - - - - -	- - Sanctioned March 1844.	- - Situated at the Chaund Paul Ghaut.	16,252 1 7	16,252 1 7	- - Completed season 1843-44.	—
Chittagong Gaol: Additions and Improvements to.	- - In consequence of the offensive state of the gaol, the want of proper ventilation, and dampness of the floor of the gaol hospital.	- - Sanctioned 17th October 1842.	Chittagong - -	1,288 11 9	1,288 11 9	- - Completed season 1842-43.	—
Calcutta: Construction of Machinery in the House of Correction, and erection of a building.	- - To employ the power of cast-iron treadmill received from England.	- - Sanctioned 16th September 1844.	Calcutta - - -	12,292 12 7	9,674 12 10	- - Completed season 1846-47.	- - The power is intended to be applied in turning a soorkee mill and grinding corn, but neither objects have as yet been efficiently attained. The value of the treadmill made over from the Arsenal in June 1843 to the D. P. Works is 3,406 rupees. The additional machinery has proved an entire failure, the treadmill being complete in itself as an engine for punishment, and having no power to work machinery attached to it.
Filling a Tank in the House of Correction, and sinking Wells.	- - The water of the tank was represented to be in a putrid state, and threatened to affect the health of the prisoners.	- Sanctioned 7th June 1847.	Ditto - - -	- - - - -	2,801 13 -	Season 1849-50 -	- - The wells will supply water for bathing, washing, &c., while the tank can be used as heretofore for drinking and culinary purposes.
Calcutta General Hospital: Excavation of two Tanks.	- - For watering the roads in the vicinity of the General Hospital.	Season 1846-47 -	Ditto - - -	- - - - -	- - An estimate has been called for; in the meantime an annual outlay of 2,248 rupees has been authorised for the payment of bheesties for watering the roads.	- - - -	- - The excavation of the proposed two tanks will reduce the labour and consequently the outlay for the bheesties, to 1,364 rupees per annum.
Chittagong Gaol: Construction of 22 Ventilators.	- - A more thorough ventilation of the gaol being considered necessary by the local and medical authorities for the improvement of its salubrity.	- - Sanctioned 20th May 1846.	Chittagong - -	731 11 8	758 - -	- - Constructed season 1846-47.	—
Calcutta House of Correction: Construction of a Pucca Tiled Shed.	- - To replace a very old shed, which has fallen into ruin.	- - Sanctioned 19th May 1847.	Calcutta - - -	1,174 - -	1,174 6 10	- - Completed season 1847-48.	—
New Residence for the Deputy Superintendent.	- - - - - - -	- - Sanctioned 26th July 1848.	Calcutta - - -	4,437 9 10	- - - -	- - Completed season 1850-51.	—

Calcutta: Construction of Quarters for four Serjeants.	- - In compliance with a recommendation from the Chief Magistrate.	- - Sanctioned 19th May 1847.	- - Situated in the north-west corner of the Police Compound at Calcutta.	5,589 -	5,714 7 -	- - Completed season 1849–50.	—
Comillah: Additions and Improvements to the Judge's Cutcherry.	- - The necessity of these additions was brought to notice by the Civil and Sessions Judge.	- - Sanctioned 24th September 1850.	- - - - - - - - - -	9,524 11 -	- - - -	- - The works originally intended to be executed were two additional upper rooms, one of $41\frac{1}{2} \times 15\frac{1}{4}$ and one $53 \times 14\frac{1}{2}$; the raising of the walls of the three old upper rooms, to make them convenient as record-rooms, and the supplying of record racks. It having been found, however, that the walls were not sufficiently strong to admit of a second story being added, it has been found necessary to construct a new Circuit House and additional record-rooms, &c.	
Calcutta: Alterations and additions to the Supreme Court's House.	- - For the better accommodation of the prisoners, and separation of those confined for heinous and slight crimes.	- - Sanctioned 11th October 1850.	Calcutta - - - - - - - - -	3,172 - 7	- - - -	- - The necessity for this work was brought to notice by the acting registrar.	
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—REVENUE:							
Calcutta: Alterations of a portion of the Audit Office.	To provide for a Stamp Office -	- - Sanctioned 19th May 1841.	Calcutta - - -	4,050 9 5	4,220 5 9	- - Completed season 1841–42.	—
Construction of a Portico to the office of the Sudder Board of Revenue.	- - - - - - -	- - Sanctioned 28th November 1842.	Calcutta - - -	819 7 6	- - - -	- - Completed season 1843–44.	—
Erection of Sheds at the Iron Bridge Yard for 20 additional Forges.	- - In consequence of the heavy demand for iron suspension bridges from all quarters, particularly for the Grand Trunk Road.	- - Sanctioned 3d May 1843.	Calcutta - - -	5,046 1 10	- - - -	- - Constructed season 1843–44.	—
CIVIL BUILDINGS, SOUTH-WESTERN PROVINCES—REVENUE:							
Cuttack: Revenue Survey-office and Record-rooms.	- - For the revenue surveyors and establishment.	- - Sanctioned 16th January 1838.	Cuttack - - -	2,071 9 4	2,071 9 4	- - Completed season 1839–40.	—
Cachar: Construction of a Treasury and Record-room.	- - For the reception of the treasure and records.	- - Sanctioned 16th January 1843.	Cachar - - -	195 6 4	195 6 4	- - Completed season 1839–40.	- - The smallness of the outlay was caused by the employment of convict labour.
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—REVENUE:							
Chunpore: Construction of a Tuhsildarry Cutcherry.	- - Rendered necessary with reference to the new settlement of land revenue in the North-Western Provinces.	- - Sanctioned season 1838–39.	In Zillah Bijnore -	3,264 - 6	- - - -	- - Completed season 1840–41.	—
CIVIL BUILDINGS, CENTRAL PROVINCES—REVENUE:							
Cuttea: Repair of the Tuhsildarry Cutcherries at.	- - - - - - - -	- - Sanctioned 27th May 1840.	- - - -	4,894 15 2	- - - -	- - Repaired season 1842–43.	—

(continued)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—GENERAL:				*Rs. a. p.*	*Rs. a. p.*		
Calcutta Mint: Construction of a Guard-house and Stabling.	To replace buildings destroyed by a storm on the 29th of April 1839.	Sanctioned season 1839–40.	Calcutta	18,850 8 10	20,626 9 1	Completed season 1840–41.	The proposed dimensions and architectural decorations were considered superior to what are usual or necessary for similar works in the place. The work is stated to have been satisfactorily done.
Calcutta Treasury: Improvements at the.	To remedy the inconvenience felt for want of office accommodation.	Sanctioned 4th March 1840.			23,138 4 6		The house used for the Savings Bank is altogether removed, and a new building erected on the entire frontage between the Treasury and the Accountant-General's Offices. The new building will be carried up to the full height of the Treasury, and will provide accommodation for the General Treasury, the Accountant-General's Offices, and the Savings Bank.
Chittagong: Repairs to the Breakwater in front of the Salt Golahs.	For the safety of the salt in store during the rains.	Sanctioned 1st April 1842.	Chittagong	12,478 6 7	14,633 1 –	Completed season 1843–44.	A saving of *Rs.* 2,154. 10. 5. occurred on the amount authorised, in consequence of a reduction in the quantity, as well as in the rates of the work.
Calcutta Custom House: Construction of additional Buildings.	To accommodate the increasing trade of the port.	Sanctioned 31st March 1841.	Calcutta	20,954 – –	19,710 1 10	Completed season 1842–43.	—
Reconstructing the Import and Export Godown Sheds.	A committee report stated that the sheds were unserviceable and in a dangerous and tottering condition.	Sanctioned 30th July 1849.	Calcutta	4,756 5 6		Completed season 1850–51.	—
Calcutta General Treasury: Additions to.	To afford additional accommodation.	Sanctioned season 1838–39.		26,021 15 6		Completed season 1841–42.	—
Calcutta: Construction of a House in the Botanical Garden.	For an assistant overseer	Sanctioned 22d September 1841.		1,913 11 4	1,803 2 9	Completed season 1842–43.	—
Construction of a Record-room.	For the General and Financial Departments.	Sanctioned 26th March 1842.		4,289 15 4	4,289 15 4	ditto.	—
Raising the Floors of two Godowns.	They were subject to inundation in heavy rains.	Sanctioned 14th September 1842.		1,325 10 6	1,412 4 8	ditto.	—
New Roofing of the Circular Cutting-out Room at the Mint.	In consequence of some of the beams having failed.	Sanctioned 8th March 1843.			2,224 11 5½	Completion not reported.	The estimate framed is for a new roof, supported on iron beams.

Quadrennial repairs to the Government House and Out-offices.	- - - - - - - -	- - Sanctioned season 1842–43.	- - - -	26,983 14 –	26,983 14 –	Season 1842–43.	—
Construction of Lecture-rooms and School-rooms at the Hindoo College.	- - For the General Committee of Public Instruction.	- - Sanctioned March 1843.	- - - -	18,152 4 5	19,634 3 –	- - Constructed season 1844–45.	- - The expense will be borne, in nearly equal shares, by Government and the College.
Repairs to the General Treasury premises.	- - - - - - - -	- - Sanctioned 8th March 1843.	- - - -	435 11 –	—		
Calcutta Medical College: Construction of Quarters for the House Surgeon and Staff Serjeant.	- - In consequence of insufficient accommodation.	- - Sanctioned 18th September 1843.	Calcutta - - -	6,091 6 5	6,319 6 11 *Rs.* 2,000 also granted for the purchase of ground required to be added to the Medical College premises.	- - Completed season 1844–45.	—
Construction of a Verandah to the Male Hospital.	- - Under a representation of its necessity from the Council of Education.	- - Sanctioned 14th July 1843.	- ditto - - -	967 14 1	1,019 3 10	- ditto - -	- - This work was necessary to the comfort, efficiency, and internal economy of the establishment.
Calcutta Medical College: Construction of a new Dissecting-room.	- - It was considered necessary to remove the dissecting operations to a distinct building; they had been carried on in a room in close proximity to the Female Hospital and quarters of the Secondary School.	- - Sanctioned 2d October 1843.	- ditto - - -	5,119 5 7	5,119 5 7	Season 1843–44.	—
Calcutta: Additions to St. James' Church.	- - The works consist of a new wooden gallery, laying a marble floor, &c.	- - Sanctioned 15th March 1843.	- ditto - - -	4,007 3 10	- - - -	- - Constructed season 1843–44.	- - Of the amount expended, *Rs.* 2,344. 2. 9. have been recovered from the vestry of the church, such being the engagement under which the work was executed.
Calcutta Government House: Construction of an Entrance Gate.	- - To the gardens south of the building.	- - Sanctioned 14th February 1843.	- ditto - - -	851 15 3	871 10 1	- - Completed season 1844–45.	Ordered by the Governor-General.
New Supreme Court House and Insolvent Court.	- - In consequence of the existing buildings and arrangements not affording the necessary accommodation for the distribution of business.	- - Estimates called for 7th June 1842.	- - - -	- - The proposal was referred to the Home authorities, to whom the necessity for the contemplated arrangements was not apparent.	3,94,530 – –	- - - -	- - The present Court-house is a public building, valued at 80,000 rupees, and the Insolvent Court is held in an adjoining building, rented at 500 rupees per mensem.
Construction of new Salt Golahs on the banks of the creek, between the islands of Kankra and Kissenpore.	- - - - - - - -	- - - - -	- - - - -	- - - - -	16,236 2 6	- - - -	- - The estimate is for ten golahs, each calculated to hold 75,000 maunds of salt, and for a maund raised 7½ feet, 717 × 264 feet for the golahs to be built on. The excavation of the work entrusted to the officers in the Salt Department, there being no officer of the Department of Public Works available for the duty.

(*continued*)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839-40, to 1850-51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—GENERAL—*continued.*				*Rs. a. p.*	*Rs. a. p.*		
Chittagong: Construction of a new tiled roof Custom-house, and purchase of a Site.	- - Required to replace a thatched shed, which is out of repair and inconveniently situated, being separated by a large nullah from the pier at Chittagong.	- - Sanctioned 8th March 1843.	Chittagong - -	5,150 1 -	5,448 - 9 Cost of site, *Rs.* 5,000	- - Completed season 1846-47.	- - The bridging of the Nullah would have been more expensive than the building the new Custom-house.
Calcutta General Post-office: Additions to.	- - Represented by the Post-master-general to be indispensable, with reference to the increased business transacted in the Post-office.	- - Sanctioned 2d July 1845.	Calcutta - - -	- - The work was suspended, the erection of an entirely new Post-office being contemplated by Government.	9,485 - -	- - - -	- - The additions will comprise an upper room 50 × 35, a room 16 × 16.
Calcutta Medical College: Construction of additional Rooms.	- - For cook-rooms to the Female Hospital.	- - Sanctioned 28th January 1846.	- - - -	551 9 1	505 - -	- - Completed season 1847-48.	—
Construction of a new Coach-house.	- - Required in lieu of the former one, which had settled and cracked.	- - Sanctioned 7th November 1845.	- - - -	1,143 - -	1,143 - -	Season 1845-46.	—
Alterations and additions to the.	- - For the better accommodation of the Military Class Students.	- - Sanctioned 26th June 1850.	- - - -	- - - - -	8,442 5 1	- - - -	- - The works contemplated are to make over to the use of the students a portion of the western ward; to construct a new close flat-roofed verandah to be added along the whole of the west side, Military Class Ward, of the Medical College, 289½ × 97; to remove the doors between the proposed verandah and ward.
Calcutta Mint: Building and fitting up an Electrotype Refinery.	- - - - - - -	- - Sanctioned 13th December 1844.	- - - -	3,510 - -	- - - -	- - Constructed season 1846-47.	—
Calcutta Stamp-office: Construction of a Drying-room over the Stables attached to the Stamp-office.	- - The necessity for this work was brought to the notice of Government by the Board of Customs, Salt and Opium.	- - Sanctioned 20th October 1847.	Calcutta - - -	2,165 1 1	2,176 13 3	- - Completed season 1849-50.	—
Cuttack: Repairs to the School-house.	- - Damage was occasioned to the school-house by a fire, which occurred on the 7th of May 1846.	- - Sanctioned 9th September 1846.	Cuttack - - -	865 1 4	- - - -	Season 1847-48.	—
Calcutta Post-office: Construction of Sheds in the Compound of the General Post-office.	- - To provide residences for the distributing peons on the spot, so that their services may be available at all hours.	- - Sanctioned 19th May 1847.	Calcutta - - -	2,194 11 -	2,199 - -	- - Completed season 1848-49.	—

Calcutta General Post-office: Construction of a Stable, Cart, and Overland Van Sheds, in the Compound of the Post-office.	- - The Postmaster-general considered the proposed works absolutely necessary for conducting the greatly increased business of the office, and more particularly of the steam branch.	- - Sanctioned 19th July 1847.	Calcutta - - -	2,505 9 11	3,107 8 9	- - Completed season 1848–49.	—
Calcutta Episcopal Residence -	- - A request of the Bishop of Calcutta to change the episcopal residence, for reason assigned by him, was complied with on the understanding that it should not involve the Government in any expense.	- - Sanctioned 31st March 1849.	Calcutta - - -	- - Value of the new palace, *Rs.* 81,718, being the purchase cost, *Rs.* 55,080. 8. 10., added to the sum expended in making alterations to the building.	- - - -	- - - -	- - A house in the Chowringhee road, lately occupied by the Hon. W. W. Bird, Governor of Bengal, has been purchased by the Bishop, and will be brought on the books as a Government building: the old episcopal residence was purchased by Government in 1838 for *Rs.* 80,000: Government, on the 15th September 1849, authorised the title deeds of this building to be placed at the disposal of the Bishop to enable his Lordship to dispose of the premises.
Calcutta: Extension of the Jetty at Bank's Hall.	- - Rendered necessary in consequence of the silting up of the river bank.	- - Sanctioned 24th July 1850.	Calcutta - - -	- - - - -	2,047 2 2	- - - -	- - The silting up of the river bank had removed the low water mark full 15 feet from the crane used by the Marine Department for landing anchors.
CIVIL BUILDINGS, LOWER PROVINCES—GENERAL:							
Chinsurah Church: Repairs to	- - The roof, owing to the decayed state of the beams, was reported to be in a dangerous state.	- - Sanctioned 23d February 1842.	- - - -	2,674 7 1¾	2,674 7 1¾	- - Completed season 1842–43.	- - This is an old Dutch building, and is supposed to have been built in the year 1685.
Cheera Coal Mines: Construction of a Roadway.	- - For facilitating the means for the conveyance of coals from the Cheera Hills to the plains.	- - Sanctioned 5th October 1842.	Cheera - - -	- - - - -	66,584 11 -	—	
Chinsurah: Enlargement of the Burial-ground.	- - - - - - -	- - Sanctioned 15th February 1847.	Chinsurah - -	- - - - -	- - The payment of *Rs.* 2,788. 11. was sanctioned, as well as the remission of *Rs.* 25. 4., or Company's *Rs.* 26. 15., on account of annual revenue.	Season 1846–47 -	- - An estimate amounting to 452 rupees was sanctioned on the 28th July 1848, for the enclosure of the newly purchased ground.
Calcutta: Renewing the Crane at the Bank's Hall, and some of the Beams and Posts of the Jetty.	- - The crane gave way whilst an anchor of about 56 cwt. was being towed off from the jetty.	- - Sanctioned 21st July 1849.	Calcutta - - -	- - - - -	1,227 15 6	Season 1849–50.	—
CIVIL BUILDINGS, SOUTH-WESTERN PROVINCES; ECCLESIASTICAL:							
Circular Road: Purchase of Land.	For a burial-ground - - -	- - Sanctioned 28th August 1839.	- - - -	1,988 1 10	19,700 - - for grounds, and *Rs.* 2,385. 9. 5. to adapt it for the object intended.	- - Completed season 1840–41.	- - The saving of *Rs.* 397. 7. 7. within the estimated amount, is owing to the material for the pathways having been obtained from certain buildings which it was found necessary to clear off the ground purchased.

(*continued*)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839-40, to 1850-51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—ECCLESIASTICAL:							
Chittagong Church: Construction of.	- - - - - - - -	- - Sanctioned 9th October 1840.	- - - -	*Rs. a. p.* 10,335 - -	*Rs. a. p.* 9,947 3 3	- - Completed season 1843-44.	- - Of the amount, 3,518 rupees has been paid by Government, and the remainder (6,817 rupees) by the community and the Church Building Fund.
MARINE BUILDINGS, SOUTH-WESTERN PROVINCES:							
Calcutta: Construction of a House and Offices for the Master Attendant.	- - Residence for the Master Attendant and offices and go-downs for naval stores.	- - - - -	- - - -	- - - - -	46,000 - -	—	
MARINE BUILDINGS, LOWER PROVINCES:							
Chittagong Pier: Construction of - - -	- - - - - - - - -	- - - - -	- - - -	6,504 14 10	6,504 14 10	Completed 1839-40.	—
Repairs to the - - -	- - In consequence of injuries done to it by marine worms.	- - Sanctioned season 1842-43.	- - - -	1,213 14 10	- - - -	- - Completed season 1842-43.	—
Chittagong: Construction of a tiled-roof Custom-house.	- - To replace a thatched shed, which is out of repair and inconveniently situated.	- - Sanctioned 8th March 1843.	- - - -	- - - - -	5,448 - 9	—	
CIVIL BUILDINGS, LOWER PROVINCES—JUDICIAL:							
Chupprah: Construction of a Hazut Tuzweez Ward.	For the Magistrate of Sarum -	- - Sanctioned 24th May 1843.	Chupprah - -	4,782 - 6¾	5,409 1 3	- - Completed season 1846-47.	—
Chitpore: Construction of a Thannah House near the Suspension Bridge.	- - To replace the former thatched building, which was destroyed by fire.	- - Sanctione4 7th July 1847.	Chitpore - -	1,150 15 7	1,150 15 7	- - Completed season 1847-48.	- - As the thannah at this locality has been burnt down three times during twelve years, the present estimate provides for the erection of a pucca building.
CANALS, NORTH-WESTERN PROVINCES:							
Doab Canal: Construction of five additional Falls and Locks.	For irrigation and navigation -	- - Estimates sanctioned in 1839.	- - Doab; the falls are to be at Lerkurrie, Hullallpore, Meg Chupper, Ruree, and Balpore.	52,356 8 1 The conversion of the 11 falls as locks from Belkee to Balpore, in Pergunnah Behut and Saharunpore, has been also effected at a cost of *Rs.* 21,040. 11. 7.	69,171 - - sanctioned for additional falls and locks.	- - Completed season 1840-41.	- - The raising of the banks of the Doab Canal was sanctioned in 1838-39; the cost was *Rs.* 70,644. 8. 6, and the entire length of the work done 385,132 feet; the additional bunding up of the main stream of the Jumna, in order to convey the water to the canal, puts an entire stop to the timber trade from the hills, but when the canal has been made navigable, this inconvenience will cease. The total amount expended on account of the Doab Canal, in 1840-41, amounted to *Rs.* 1,15,156. 12. 1., and the direct return to 1,65,965 rupees.
Introduction of Rajbuhas in the tract between the Canal and the River Hindun.	- - These rajbuhas are water channels, which, diverging from the main stream of the canal, flow to a considerable distance from its line, and serve to extend the irrigation to numerous villages, which could not, without much inconvenience and many disputes, obtain water direct from the canal itself; they are very useful works, and likely to afford a good return for the outlay expended on them.	- - Estimates sanctioned May 1839.	- - - -	20,000 - -	20,000 - -	Season 1839-40 -	- - This sum of 20,000 rupees was placed at the disposal of Captain Cautley, for the introduction of rajbuhas, or watercourses, on a tract of land lying between the Doab Canal and the River Hindun, a great part of which had fallen to the British Government by the death of her Highness the Begum Sumroo.

Plantations of trees on the banks of the.	- - - - - - - -	- - From 1830 to 1840–41.	- - - - -	14,391 12 7 Amount realised from cuttings, 10,435 rupees.	- - - - -	- - The number of trees on the banks of the Doab Canal, to 30th April 1843, was 235,327, and their value was estimated at 30,000 rupees; a sum of *Rs.* 9,872. 4. 4. had been realised by the sale of timbers.
Connexion of the, with the Dumola River.	- - - - - - - -	14th September 1839	Doab Canal - -	- - - - - -	13,800 - - sanctioned for the construction of aqueducts.	—
Delhi Canal - - - -	- - - - - - - -	- - - - -	- - - - -	- - - - - -	- - The amount of expenditure incurred on account of plantations on the banks of the Delhi Canal to the 30th April 1847, was *Rs.* 27,363. 5. 7.; the amount realised *Rs.* 52,025. 12. 6.; and the estimated value of the trees on the banks of the canal, *Rs.* 5,66,998. 5. 4. Orders, were reported in season 1848–49, for the removal of 5,746 trees; the number remaining amounted to 369,646 of different ages, and their value was estimated at *Rs.* 5,57,828. 2. 8.	—
Deyra Dhoon: Construction of a Masonry Tunnel in lieu of a wooden one on the Beejapore Canal.	- - The wooden tunnel was a source of much trouble and expense, owing to the repairs which it constantly required.	- - Sanctioned 26th September 1843.	- - Situated near the village of Dakra.	3,358 1 6 *Rs.* 6,244 sanctioned for the construction of falls, or masonry descents, for the passage of the waters.	2,996 14 -	- - Completed season 1844–45.	—
Rajpore Watercourse - -	- - To supply pure and wholesome water to the town of Deyra for domestic purposes.	- - Length 7½ miles; sanctioned 8th March 1841.	- - From the hills at Rajpore to the town of Deyra.	42,984 11 9	41,207 2 4	- - Constructed season 1844–45.	- - The object for which this watercourse was constructed has been fully obtained, the water running in a clear and pure stream.
Setting up of a Saw Mill - -	- - The watercourses in Deyra are stated to be peculiarly applicable to machinery of all kinds.	- - Sanctioned 11th September 1843.	At Dhurrumpore - -	3,567 3 7	- - - -	- - Constructed season 1844–45.	- - The cost includes the adapting of machinery to the building erected; the machinery to be applicable to vertical as well as circular saws.
Construction of 12 small Reservoirs on the Rajpore Watercourse.	- - Intended for watering the village cattle, and they will relieve the main stream intended for drinking purposes from impurities, of which it could not be kept free so long as cattle resorted to it generally.	- - Sanctioned 14th June 1844.	In the Deyra Dhoon	1,608 - -	1,608 - -	- - Constructed season 1844–45.	—
Construction of 4 Corn Mills on the Beejapore Watercourse.	- - The construction of those mills will be advantageous to the Government, as well as to the inhabitants, who now carry their corn to other mills distant between four and five miles.	- - Sanctioned 15th June 1844.	- - ditto - -	2,500 - -	2,500 - -	- - Constructed season 1844–45.	—

(continued.)

No. 6.—Statement compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
Canals—North-Western Provinces—*continued.*				*Rs. a. p.*	*Rs. a. p.*		
Delhi Canal:							
Masonry bridge over the Bouranee Outlet Nullah, on the Delhi Canal.	In lieu of an old bridge, two arches of which had fallen.	Sanctioned 4th October 1839.	Situated near the village of Shahpore.	2,315 3 10	3,330 9 9	Completed season 1840–41.	The savings are ascribed to the substitution of gratings at the depth of six feet, instead of cylinders, under the wing walls.
New cut for protecting the Channel, and for the security of the Dadoopore Dam.	To protect the Delhi Canal from injury by incursions of the Soanee River.	Length 11,200 feet, width 75 feet, average depth 9 feet.	Delhi - - -	1,779 13 2	1,779 13 2	Completed season 1843–44.	The cut has since been widened by the action of the current to twice its original dimensions.
Protection to the west flank of the Dadoopore Dam.	For securing the right bank of the Sombe River from the attacks of the current after it leaves Baker's Cut.	- - - -	- - - -	5,005 4 1	5,632 9 10	Completed season 1849–50.	—
Bridge over the Delhi Canal at Rhudour.	To promote the traffic of the town of Rhudour.	Sanctioned 15th August 1837.	- - - -	9,577 5 2	- - - -	Completed season 1841–42.	The roadway is of timber, and is supported on masonry piers.
Construction of an Iron Suspension Bridge at Indore, over the.	With a view to the maintenance of the communication of the country.	Sanctioned 24th August 1838.	- - - -	13,267 7 5	- - - -	Completed season 1840–41.	—
New channel under the Indore Bridge.	- - - - - -	Sanctioned 24th August 1838.	- - - -	15,717 14 2	18,122 15 5	Completed season 1842–43.	The soil through which the new cut was to be excavated proved to be so saturated with water as to prevent a greater depth of excavation than four feet being attained. The action of the current has however cleared out the channel to the depth of eight or nine feet.
Construction of a Dam Bridge across a ravine at Dadoopore.	In lieu of an overfall drain bridge, which was carried away during heavy rains in 1841.	Sanctioned 15th April 1843.	- - - -	- - - - -	548 15 10	—	
Construction of two Inlet Bridges over ravines, entering the Canal near the Pucca Tank, west of Hissar.	These inlet bridges are necessary to preserve the continuity of the embankments, and to check the influx of silt, at a point between the pucca tank of Hissar and the village of Solumno Shekspore, where both banks of the canal are interrupted by ravines, which enter the canals at opposite points.	Sanctioned 19th June 1847.	- - - -	- - - - -	1,141 - 10	—	
Deyrah Doon:							
Construction of Corn Mills -	- - - - - -	Sanctioned 6th July 1844, and 30th August 1844.	Under the town of Rajpore.	4,938 2 -	For 8 mills, *Rs.* 5,414 „ 6 „ 3,960 *Rs.* 9,374	Constructed season 1845–46.	—
Compensation to individuals for loss of property and profit.	In consequence of the water from the old Rajpore watercourse having been turned into the masonry channel.	Sanctioned 18th May 1845. Sanctioned 24th July 1845.	- - - -	2,732 13 - 4,205 - -	- - - -	- - - -	Ten miles already constructed by Government on the watercourse, have been rented for upwards of 4,000 rupees per annum.
Reconstruction of the Dakra Aqueduct.	This aqueduct was severely damaged by heavy rain on the 27th July 1844.	Sanctioned 2d December 1844.	- - - -	1,542 10 1	1,480 - -	Completed season 1845–46.	

Repair of 13 Tanks	To making them serviceable as reservoirs for irrigation.	Sanctioned 10th July 1845.		5,004 10 7½	5,004 10 7½	Season 1845–46.	—
Dooab Canal							Total amount expended on account of canal works, including current expenses to 1st May 1847 — *Rs.* 23,20,868 11 7; Deduct value of dead stock — 8,01,983 12 2; 15,18,884 15 5; Amount realised by revenue — 14,63,196 4 11; Deficit, *Co.'s Rs.* — 55,688 — —
							The amount expended on account of plantations on the banks of the Dooab Canal, to 30th April 1847, was *Rs.* 21,182. 12 *a.* 2 *p.* The amount realised, *Rs.* 6,505. 8 *a.* 9 *p.*, and the value of the trees on the canal banks, 1,46,793 rupees.
Restitution of the Newgong Dam, and construction of a Retaining Dam.	Greatly injured by a flood on the 21st June 1841.	Sanctioned 24th March 1843.		36,694 4 5	30,745 — —	—	
Constructing the Outlets of the Head of the Puthine Rajbuha, in the North Division of the.	With the intention of protecting the head supply, as well as giving the power of delivering water into the rajbuha, or irrigation channel, with greater facility.	Sanctioned 20th September 1844.		656 9 —	661 8 8	Completed season 1846–47.	—
Clearance of the Khorra Head of the Canal.	In consequence of a change which took place in the main channel of the Jumna towards the close of last rains.	Sanctioned season 1844–45.			1,871 4 6	Season 1844–45.	—
Dadoopore Dam:							
Protection of the East Flank of the.	By securing the right bank of the Jumna against further encroachments of that river.	Sanctioned 26th July 1845.		6,717 6 9	6,073 — —	Completed season 1846–47.	—
Measures for the security of the Canal Works.	The floods of July 1845, from their long duration and extreme violence, did considerable injury to the crib spurs intended for the protection of the right bank of the Jumna, to the earthen bund on the Sombe.	Sanctioned 19th March 1846.		15,211 — —	14,647 — —	Completed season 1846–47.	—
Delhi Canal:							
Improvements of the Embankments of the.	With a view to confine the canal within certain limits.	Sanctioned 9th September 1845.	Near Hissar	9,290 — —	9,290 — —	—	In consequence of too great an economy in the original construction, the canal constantly floods the land in the vicinity of Hissar.
Delhi Canal:							
Construction of 20 second-class Chowkies, and furnishing Chowkies.	Necessary to enable the superintendent and his establishment to pass with convenience and rapidity along the line.	Sanctioned 1st December 1845.			6,714 — —	Season 1845–46.	—
Delhi Canal:							
Construction of five first-class and six second class Chowkies.	Sanctioned, after personal inquiry as to their necessity.	Sanctioned 7th May 1845.			9,133 4 10	Completed season 1845–46.	—

(*continued*)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CANALS, NORTH-WESTERN PROVINCES—*continued.*				*Rs. a. p.*	*Rs. a. p.*		
Dooab Canal:							
Construction of three Bridges on the.	To facilitate the communication of the country. At present the villagers, with difficulty and inconvenience, ford the canals at their respective ghauts.	Sanctioned 3d April 1846.	At Admerpore, Kyampore, and Behlap, in the South Division.	4,004 – 9	4,394 – –	Completed season 1847–48.	—
Alterations to 15 Bridges on the.	With a view to give an increased and less impeded waterway.	Sanctioned 28th March 1846.	In the centre division.	7,270 3 9	8,528 – –	Completed season 1847–48.	—
Digging of the Manti Rajbeeha on the.	To give a supply of drinking water to 33 villages in the district of Seharunpore, and for irrigation.	Sanctioned 22d November 1841.	- - - -	- - - - -	An advance of 19,120 rupees sanctioned on the 22d November 1841.	- - - -	The return to the State will be about 5,500 rupees per annum.
Construction of a Dam with Bridge for.	For securing all the Dooab Canal escape water for the Delhi Canal.	Sanctioned 23d October 1841.	At Fysabad - -	13,881 3 1	13,304 – – for a bridge *Rs.* 3,021. 3.	Completed season 1843–44.	This outlay will soon be repaid by the return derived from the employment in irrigation of the quantity of water now lost, and by the annual saving of the expense of temporary bunds.
Construction of Drains for irrigation.	- - - - - -	Sanctioned 31st May 1831.	- - - -	16,221 8 2	16,376 8 2	Completed season 1841–42.	—
Dooab Canal:							
Construction of a third Chamber at the Ghinca and Megla Falls.	To facilitate repairs, and to avoid the necessity of forming cuts around the Falls for the passage of water, and thereby admitting silt at the same time into the canal.	Sanctioned season 1838–39.	- - - -	20,761 11 –	13,518 5 3	Completed season 1841–42.	The estimate is exceeded by the amount of *Rs.* 7,243. 5. 9., owing to the difficulties which had to be overcome.
Construction of a third Chamber at the Rundole and Bobyla Falls.	- - - - - -	Sanctioned season 1838–39.	- - - -	7,996 3 1	10,178 – 2	Completed season 1841–42.	There not having been any natural difficulties to overcome in this work, the charge is by *Rs.* 2,181. 13. 1. less than the sanctioned estimate.
Construction of a Fall at Behut, between the Miskarra Dam and Bekla Falls.	To lessen the velocity of the water in that part of the Dooab Canal, and its injurious effects on its bed and sides.	Sanctioned 14th March 1837.	- - - -	22,885 15 6	14,743 – 9	Completed season 1841–42.	Owing to the difficulties met with in the execution of the work, the bill has exceeded the estimate by *Rs.* 8,142. 14. 9.; but no blame attaches to the executive officer.
Construction of an additional Tail to the Nowgong Dam.	Necessary for the safety of the dam.	Sanctioned 19th April 1842.	- - - -	16,486 11 9	18,000 – –	Completed season 1842–43.	This dam was almost entirely destroyed by a severe flood on the 21st June 1841.
Dadoopore Dam - - -	Repair of breaches made by floods in July 1845.	Sanctioned 18th August 1846.	- - - -	1,756 6 1	- - - -	Completed season 1846–47.	—
Delhi Canal:							
Construction of a Pucca Revetment.	This work will conduce to the appearance of the Canal, and to the comfort, and perhaps even the health of the inhabitants of Delhi.	Sanctioned 3d September 1846.	- - - -	- - - - -	9,277 – –	—	

Construction of 114 Masonry Outlets on the banks of the Canal.	- - - - - - -	- - Sanctioned season 1846-47.	- - - -	16,059 12 2	- - - -	- - Completed season 1846–47.	- - These are fitted with lever frames, lever sluice and shutters.
Dooab Canal : Improvement to the Romalla and Kandraoli Bridges.	- - To remedy the inconvenience experienced in the free transit of boats between Selimpore and Shamli.	- - Sanctioned 8th June 1846.	Dooab Canal - -	2,347 13 5	2,338 - -	- - Completed season 1847–48.	- - The superstructure of these bridges has been raised.
Construction of 60 Cross Drains attached to the ramps of 30 Bridges.	- - The ramps are high and massive, and as they intersect the natural drainage of the country at right angles, the rain water, without these drains, would have accumulated on the upper side of the ramps, and noxious swamps have been formed.	- - Sanctioned 5th March 1847.	- - - -	- - - - -	5,174 6 -	—	
Protection of the Gundewar Bridge by a masonry Tail.	- - Considered indispensable to the safety of the bridge, which has been considered for some time past in a precarious state.	- - Sanctioned 17th December 1846.	- - - -	- - - - -	3,021 2 -	—	
Construction of a first-class Chokee at the Kharra or upper head of the Canal.	- - It was considered desirable to have a depôt for tools and stores at the head work, instead of having to depend on that at Nyaskur, the nearest first-class chokee, which is at a distance of 6½ miles from the Kharra head.	- - Sanctioned 10th December 1846.	- - - -	1,191 9 8	1,193 7 4	- - Completed season 1849-50.	—
Delhi Canal: Repair of the Madhilpore Bridge over the.	To increase the waterway - -	- - Sanctioned 23d June 1847.	Madhilpore - -	- - - - -	2,490 - -	- - - -	- - The eastern abutment of the bridge was turned by the floods of August 1846, and as the Canal is about 20 feet wider than the length of the bridge, it is proposed to reconstruct the abutment as a pier, and to add an arch of 22 feet to the bridge.
Dooab Canal : Reconstruction of Watermill's Range.	Nos. 17 and 18 - - - -	- - Sanctioned 13th March 1847.	Delhi - - -	681 - -	681 - -	- - Re-constructed season 1847–48.	—
Delhi Canal : Formation of Road Embankments.	- - These artificial banks, constructed on low ground, confine the waters of the canal within their limits, and prevent the formation of swamps.	- - Sanctioned 19th September 1845.	- - - -	13,974 6 6	- - - -	- - Completed season 1847-48.	- - The swamps originated in too great an economy in the construction of a canal, which was led through low and broken ground without any measures being adopted to confine its water.
Construction of Buildings -	- - For a dispensary and quarters for the sub-assistant surgeon appointed to the medical charge of the canals at Dadoopore.	- - Sanctioned 17th February 1848.	Dadoopore - -	960 15 9	1,029 - -	- - Completed season 1848–49.	—
Defining the Boundary of Canal property in the city of Delhi.	- - It was impossible to recognize the boundary of the property.	- - Sanctioned 23d October 1849.	Delhi - - -	958 - -	958 - -	Season 1849–50.	—
Construction of new Chokies -	- - For the convenience and efficiency of the canal establishment.	- - Sanctioned 21st February 1850.	- - At Gungatole Narnoand, Landakherra and Kylana.	- - - - -	2,805 - -	—	

(*continued*)

No 6.—Statement compiled from the Reports of the Military Board at Bengal, from Season 1839-40, to 1850-51 inclusive—*continued*.

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
Canals, North-Western Provinces—*continued*.				*Rs. a. p.*	*Rs. a. p.*		
Delhi Canal—continued. Construction of masonry Bridges.	To replace the cross bridges of wood, which were not considered sufficiently strong to bear the heavy traffic of that country.	Sanctioned 8th October 1849.	At Jooah and Chota Thannah.	-	For Jooah Bridge, 1,978 rupees; Chota Thannah, *Rs.* 1,062. 0. 2	Season 1849-50	The Jooah bridge to have one arch, with a waterway of 34 feet; the Chota Thanna bridge one arch, 30 feet span.
Alteration of one mile of the Canal, between the Bridges Kuttra and Bolak Begum, near the city of Delhi.	To render the Delhi branch available for rafts and boats up to the walls of the city.	Sanctioned 24th October 1850.	Delhi	-	*Rs.* 7,730. 5. 2. and 1,200 rupees as compensation for the land.	-	The canal, on its new line, will have open clear banks for inspection or preservation, instead of obstructions by old enclosures, gardens, tombs, &c.; boats and rafts will be enabled to pass down to the city walls and to the Cabul gate, through the removal of old bridges, &c.
Dooab Canal: Construction of masonry Heads to nine Rajbuhas.	For the protection of the banks	Sanctioned 5th June 1847.	Dooab Canal	-	3,631 11 -	—	
Construction of two Flour Mills on the Cardbunna and Madhoopore Rajbuhas.	In order that advantage might be taken of water-power available in these rajbuhas.	Sanctioned 5th August 1847.		2,214 7 7	2,378 2 8	Completed season 1849-50.	There is every reason to believe that the outlay will be turned to good account.
Mangoe Gardens, under the Superintendent of the Dooab Canal.	For supplying the mangoe fruit and grafts of the trees.	Sanctioned 29th November 1849.	The gardens are at Manickmew, Berkherree Dowlah, Surrowlie and Selimpore.	-	8,040 5 9	Completed season 1849-50.	The only garden which had reached the self-supporting stage was that at Surrowlie, which had paid 8 per cent. on the outlay. The fruit and grafts were in great demand by the natives; notwithstanding the price of the grafts had been raised from 2 annas to 6 annas, there was no diminution of the demand.
Cut to complete the drainage of the country round the town of Shamlie.	To excavate a straight channel for the Shamlie Nullah, from the escape of the Shamlie Mills to the Khern outlet cut.	Sanctioned 22d June 1848.		2,068 13 -	2,260 - -	Completed season 1849-50.	The total length of this cut is 14,476 feet; the expense of this cut, and of its future repairs, is to be charged in equal proportion to the canal and local funds.
Construction of a second Head to the Seharunpore Mill Cut.	To prevent the stoppage of the mills when the supply is cut off from the first head, to enable the workmen to clear away the silt, which is freely deposited in this channel.	Sanctioned 28th August 1847.		1,815 2 4	2,198 - -	Completed season 1849-50.	—
Construction of the Amith Mhaw Cut, with two masonry Bridges.	This cut was made to enable the natural drainage of a large tract of ground to pass freely through the canal embankments.	Sanctioned 30th May 1846.	In Pergunnah Gungo, Zillah Seharunpore.	1,436 3 3	-	Constructed season 1847-48.	The land thus relieved from standing water is now available for cultivation.
Deyrah Doon: Repairs to the Rajpore Watercourse.	The Ruspinmah River has been turned back to its old channel.	Sanctioned 12th May 1847.		1,573 - -	1,573 - -	Completed season 1847-48.	—

ROADS AND BRIDGES, SOUTH-WESTERN PROVINCES:							
Diamond Harbour and Barripore Roads: Repair of the portion between Gurriahaut and Barripore.	- - Both these lines are much out of repair, and are much wanted to enable the cultivators to bring the produce of their lands to Calcutta.	- - Sanctioned 6th April 1841.	In the 24 Pergunnahs	10,190 12 2	10,190 12 2	Season 1841-42 -	- - An attempt was made to obtain the assistance of the landholders; but nearly all the estates along the line were under the management of the Government officers, and accordingly the State was, in fact, the Zemindar.
ROADS AND BRIDGES, LOWER PROVINCES:							
Dandpore to Sheerpore: Construction of a new Road.	- - In lieu of a road which had been carried away by encroachments of the River Ganges.	- - Length 13 miles; sanctioned 4th June 1839.	Sheerpore - -	1,592 4 -	1,592 4 -	Season 1839-40 -	This new line is taken well inland.
Doudcondy to Mungdo: Construction of 40 wooden Bridges.	- - - - - - -	- - Sanctioned 27th May 1841.	- - Chittagong to the Ferry near Company Kattath.	3,625 6 8	3,625 6 8	- - Completed season 1841-42.	- - All the masonry bridges on this line are being repaired, great damage having been done by an unusually severe flood.
Darjeeling and Calcutta Road -	- - To perfect the communication between Calcutta and Darjeeling, which new station is becoming a place of general resort for invalids.	- - Length about 363 miles; sanctioned season 1840-41. Berhampore to Baraset, 120 miles; Baraset to Kishnagur, 50 miles.	Calcutta - - -	- - The work has been performed under divisional superintendence. No general return of the amount of advances has been prepared, but so far as can be ascertained, the amount expended for road works, bridges and bungalows, to the period of its completion, has been about 95,957 rupees.	- - - -	- - Completed season 1843-44.	- - The old line of road between Berhampore and Dinagepore *viâ* Malda, has been abandoned, and a new line, 30 miles shorter, adopted. This road was reported to have been put in a perfect state of repair as a dry weather communication, and it would only require ordinary repairs after the rains of each year. It had been intended, when the road was first projected, to employ convicts extensively on it, but, owing to great sickness, the convicts were entirely withdrawn.
Darjeeling: Road from, to the foot of the Hills.	- - This work, when finished, will be eminently useful.	- - Length 33 miles and 181 yards; sanctioned 30th November 1840 and 1841.	- - Hills above Darjeeling.	- - The aggregate cost of this line was 66,829 rupees, including that of bungalows, &c.	28,396 11 2	- - Completed season 1840-41.	- - This road has been opened for foot passengers by Lieutenant Napier, of the Engineers, and is quite practicable to travellers and laden coolies. Of this line 23¾ miles are opened to the full width of 11 feet, 3 miles to 9 feet, and 6½ to 6 feet. The execution of the work has been attended with great labour. The excess of expenditure is owing to the employment of hired labour in lieu of the Sebundy sappers, a sufficient number of whom could not be spared.
Darjeeling Road:							
First Division; construction of three Bridges and six Drains.	- - - - - - -	- - Sanctioned 28th December 1841.	Berhampore - -	7,087 10 2½	7,087 10 2½	- - Completed season 1844-45.	—
Second Division; construction of Wells.	- - For the convenience of travellers.	- - - - -	- - Between Burgatchee and Dinagepoor.	436 6 6	436 6 6	- - Constructed season 1842-43.	—
Construction of roads in the neighbourhood of, including the "Auckland Road."	- - For facilitating the means of communication.	- - Length about 4½ miles; sanctioned season 1844-45.	Darjeeling - -	4,499 8 -	- - - -	- - Completed season 1844-45.	—
Construction of a wooden Bridge.	- - - - - - -	- - Sanctioned 17th September 1849.	- - Over an embanked road across the Jheel, connected with the Barrow Karry, on the south side of the Pransawgor Tank, on the Darjeeling road.	841 8 10¼	756 - -	- - Completed season 1849-50.	- - The bridge is on saul framework, of three openings of 14 feet wide by 7 feet high; the Pransawgor embankment is in length 3,309 feet, and in height 7 feet, and dams up the Barrow Karry on its northern side; the Karry passes through the embankment by a bridge, affording a waterway of 277 feet in length by 12 feet in height, and there are also two small planked drains in the bund, which, at its southern end, is annually inundated, and cut away by the rush of water which tops the embankment, owing to the waterway afforded being insufficient. This can only be prevented by the construction of the bridge.

(*continued*)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
ROADS AND BRIDGES, LOWER PROVINCES—*continued.*							
Darjeeling Road—continued. Formation of a new piece of road on the Darjeeling route.	In lieu of the road between Burgutchy and Godagaree, which was liable to be cut away and inundated.	Length 5 miles and 33 yards. Sanctioned 14th March 1848.	On the Darjeeling route.	*Rs. a. p.* 1,136 9 11	*Rs. a. p.* —	Completed season 1849–50.	—
Dinapore to Bankipore: Reconstructing the Pucka portion of this Road.	Leading from the Main Guard Bridge at Dinapore to the Parade at Bankipore.	Sanctioned 14th May 1845. Length 7¼ miles.	Bankipore	12,775 11 11½	—	Completed.	—
Darjeeling Road: Dinapore to Bankipore; re-metalling of the Pucka portion of this Road.	This road connects the city of Patna with the cantonment of Dinapore.	Length about 7¼ miles from the Main Guard Bridge at Dinapore to the Parade at Bankipore. Sanctioned 17th February 1851.	Bankipore	—	14,363 8 —	—	The width of the metal is 26 and 20 feet.
Repair of the road between Dum Dum and Cossipore.	—	Length 3 miles. Sanctioned 3d December 1839.	Cossipore	6,776 — —	6,776 — —	Completed season 1839–40.	This is a pucka road.
Dinagepoor Bridge, over the Guggrah Nullah at.	Required in the place of the Creighton's Pucka Bridge, which was destroyed by an inundation in July 1841.	The water-way of this bridge is 191 feet in length. Sanctioned 9th January 1843.	Dinagepore	6,601 11 6¼	8,260 11 2	Completed season 1847–48.	
ROADS AND BRIDGES, NORTH-WESTERN PROVINCES:							
Delhi to Shamlie viâ *Kurnaul*: Estimates for bridging and metalling the Road.	—	Estimate submitted July and August 1840.	Shamlie	—	2,95,056 — —	—	The work has been placed in the hands of the local civil officer; the expense to be defrayed from local funds.
Delhi: Projects for a permanent communication across the Jumna at.	A permanent communication at the point proposed is important in a military point of view, as it would provide the ready means of access to the city of Delhi, and the arsenal it contains, from the neighbouring cantonment of Meerut, in the Dooab. In a commercial point of view it is important to connect Delhi with the grand trunk road, and so form a good means of transit for the valuable merchandize which passes through Delhi in either direction, from the east or west.	Submitted to the Lieutenant-governor on the 3d April 1846.	Delhi	1st Scheme. By a causeway and bridge of boats: Causeway — *Rs.* 1,50,000; Bridge of boats — 1,00,000; Total *Rs.* 2,50,000. 2d Scheme. By a suspension bridge with causeway: Suspension bridge — *Rs.* 7,00,000; Causeway — 1,50,000; Total *Rs.* 8,50,000. 3d Scheme. By a masonry bridge and causeway: Masonry bridge — *Rs.* 4,50,000; Causeway — 1,50,000; Total *Rs.* 6,00,000.	—	—	The Governor-general admitted the importance of the work, but was nevertheless of opinion, that in the present state of the finances, other public works of still greater utility must have the preference.

Construction of a Causeway on both banks of the River Jumna, having two openings, each duly provided with Pucca Bridge Heads, for the passage of the waters of the river.	- - - - - - -	- - Sanctioned 22d July 1846.	- - From the terminus of the grand trunk road at Selempore to the Negumbode gate of the city.	- - - - -	1,37,481 - -	- - - -	- - The less expensive project of a causeway with two openings was sanctioned by the Governor-general in July 1846. The main opening having a span of 2,800 feet, the other, immediately below the Negumbode gate, of 200 feet, making a total of 3,000 feet, or allowing for the floating of 80 boats, 24 feet wide, drawing 1. 6. 0. water (assuming the main depth of the river at 8 feet), an uninterrupted waterway of 2,670 feet.
ROADS AND BRIDGES, CENTRAL PROVINCES:							
Deeskullee Bridge over the Gungee Nullah, on the road from Benares to Ghazeepore.	- - This bridge was required in the place of one built in 1820, which, owing to an insufficiency of waterway, fell in the year 1830.	- - - -	- - - -	14,087 - 3	- - The immediate space will be filled by a bridge of boats, which will be formed and maintained by the Ferry Fund Committee.	- - Completed season 1841–42.	- - This bridge is of three arches, of 35 feet span each.
Deeodee River: Construction of a Causeway across the.	- - To supersede the construction of a bridge which would have cost, by a rough calculation, about 40,000 rupees.	- - Sanctioned 7th October 1846.	- - - -	7,866 8 5	7,909 - -	- - Completed season 1846–47.	- - The length of the pucca pavement is 201 feet clear roadway, of which 156 feet are level, and raised one foot above the highest dry weather stream.
ROADS AND BRIDGES, SOUTH-EASTERN PROVINCES:							
Dum Dum to Baraset, repairs of the Pucka Road.	- - Forms a part of the road to Darjeeling.	- - Length 7 miles; sanctioned 15th April and 31st May 1844.	Baraset - - -	7,153 9 3	7,153 9 3	- - Completed season 1844–45.	—
Darjeeling Road: Construction of 13 Houses.	- - For the accommodation of dawkbearers, and to prevent their resorting in bad weather to the villages at some distance from the road for protection, and thus occasioning much delay and inconvenience to travellers.	- - Sanctioned 23d May 1843.	- - Between Bargatchee and Tittalya, *vid* Dinagepore.	635 6 6	- - - -	- - Completed season 1845-46.	—
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES:							
Dhullanduh Insane Hospital: Construction of Sleeping Sheds for Guards.	- - Constructed by orders to the address of the Sessions Judge of the 24 Pergunnahs.	- - Sanctioned 6th October 1848.	Dhullundah - -	1,455 11 2	1,455 11 2	- - Constructed season 1849–50.	- - This work was executed under a contract.
Construction of additional Verandahs, Cook-rooms, &c.	- - - - - - -	- - Sanctioned 25th May 1848.	- - - -	2,528 2 10	- - - -	- - Completed season 1850–51.	—
CIVIL BUILDINGS, CENTRAL PROVINCES—JUDICIAL:							
Dumoh: Construction of a Fortified Gaol at.	- - - - - - -	- - Sanctioned 16th April 1845.	Dumoh - - -	22,735 9 2	20,460 7 2	- - Completed season 1848–49.	- - Government expressed a desire that the building should be calculated for defence by a small body of men, and that provision should be made within the gaol for the occasional close confinement of all the prisoners. The new gaol has been accordingly made to consist of a centre barrack of two wards, empty bastions, with tower curtains, solitary cell, airing yard, reservoirs, drains, aqueducts, cesspools, &c. &c.
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—JUDICIAL:							
Delhi Gaol: Construction of Gaol Wards, with Cook-rooms and Guard-rooms.	- - - - - - -	Season 1841–42 -	Delhi - - -	9,542 5 11	9,999 - 3	- - Completed season 1842–43.	—

(continued)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839-40, to 1850-51 inclusive—*continued*.

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—JUDICIAL—*continued*.							
Delhi Hospital	For insanes	Sanctioned 9th March 1841.		*Rs. a. p.* 25,723 – 10 (Exclusive of *Rs.* 399. 5. for clearing and levelling a portion of the site for the asylum.)	*Rs. a. p.* 26,963 4 1	Completed season 1846-47.	The plan provides for a main building, a separate place for convalescents, and for a garden.
Deyrah Gaol		Sanctioned 1838-39		18,553 11 6	15,808 2 7	Completed season 1840-41.	The excess of *Rs.* 2,744. 8. 11. over the estimated cost, is owing to a failure in the executive officer's kilns, and the necessity he was under of purchasing bricks from the bazaar, and also to the execution of additional work.
Delhi Gaol Hospital: Construction of a new Roof.		Sanctioned 16th August 1841.		2,586 6 1	2,757 15 –	Completed season 1842-43.	—
Delhi: Construction of a new Kotewallee for the city, and a Lock-up House.	The old Kotewallee is in a dangerous dilapidated state, part having already fallen.	Sanctioned 4th April 1845.	Delhi	For the lock-up house, 2,369 10 10	For the *Rs. a. p.* Kotewallee 5,929 1 4 Lock-up house 2,446 5 – *Rs.* 8,375 6 4	Completed season 1846-47.	The execution of these works devolved on the magistrate.
Delhi Penitentiary: Additions to the.	In compliance with the orders of the Lieutenant-governor for the introduction of a capstan mill, to be worked by the prisoners.	Sanctioned 23d May 1845.	Ditto	934 4 4	1,358 10 6	Completed season 1846-47.	—
CIVIL BUILDINGS, LOWER PROVINCES—JUDICIAL:							
Dinagepore Gaol:							
Drainage and Ventilation of the.	To improve the salubrity	Sanctioned January 1840 and April 1841.	Dinagepore	3,227 10 8	3,780 – –	Completed season 1842-43.	—
Addition of 13 Skylights	Ditto	Sanctioned 28th February 1842.	Ditto	8,149 13 –	8,149 13 –	Season 1842-43.	—
Dacca Insane Hospital:							
Construction of additional Cells.	In consequence of the insufficiency of the accommodation.	Sanctioned 24th July 1843.	Dacca	1,228 5 4	1,228 5 4	Constructed season 1843-44.	—
Construction of quarters for the Native Doctor and Darogah.	Ditto	Sanctioned 26th December 1843.	Ditto			Completed season 1843-44.	—
Durrung: Construction of new Buildings.	In lieu of the existing cutcherry gaol and thannah, which are in a totally decayed state.	Sanctioned 3d November 1841.	Durrung	1,217 11 7	1,158 11 –	Completed season 1844-45.	—

Debrooghur:						
Construction of a Gaol at -	-- For the accommodation of 136 prisoners, males and females.	- Sanctioned 3d April 1843.	- - - -	6,495 1 10	6,506 5 7	-- Completed season 1844–45.	—
Construction of a Circuit Bungalow.	-- In consequence of the inconvenience experienced by the Deputy Commissioner in holding his Court, from the want of proper buildings.	-- Sanctioned 14th August 1843.	Debrooghur - -	1,160 2 11	1,746 2 6	-- Completed season 1845–46.	—
Dumoh: Construction of a new defensive Gaol.	- - - - - - -	-- Sanctioned 27th January 1844.	Dumoh - - -	- - - - -	16,662 14 –	- - - -	-- Government expressed a desire that the buildings should be calculated for defence by a small body of men, and that provision should be made for the occasional close confinement of all the prisoners, so as to enable a small body of troops to retain the prisoners.
Deebrooghur: Construction of a new Cutcherry.	-- In lieu of a similar one condemned by the annual Survey Committee.	-- Sanctioned 3d February 1846.	Deebrooghur - -	900 – –	5,822 1 7	Season 1847–48 -	-- The purchase of Captain Fagan's bungalow for 900 rupees, for a cutcherry, was authorised on the 9th June 1847, as the site was better than any other that could be obtained.
Dinagepore: Improvements to the Magistrate's Cutcherry, by the construction of a Room with Verandahs.	-- The insufficiency of the existing building was brought to notice by the civil authorities, who preferred the present arrangement for improving the buildings to assigning the upper apartments of the judge's old cutcherry to the magistrate, which would have been difficult of access to the poor.	-- Sanctioned 7th July 1847.	Dinagepore - -	3,766 1 6¾	3,927 – –	-- Completed season 1849–50.	-- The room is to be 40 × 24 feet, with a 10 feet verandah on the east, west, and south sides.
Debrooghur: Construction of a new Gaol Hospital.	-- The new hospital will be built on a better site; the present buildings, owing to the want of ventilation, are very damp and unhealthy.	-- Sanctioned 12th May 1847.	Debrooghur - -	- - - - -	631 1 4	—	
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—REVENUE:							
Datagunge, in the District of Budaon: Construction of a Tehsildarry Cutcherry at.	- - - - - - -	-- Sanctioned 13th December 1838.	Datagunge - -	4,360 12 –	4,360 12 –	-- Constructed season 1838–39.	—
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—GENERAL:							
Delhi:							
Improvements to the Staging Bungalow.	-- The alterations consist in the addition of new dressing and bath rooms, the construction of a verandah, and throwing a thatch roof over the flat one.	-- Sanctioned 9th April 1845.	Delhi - - -	1,849 10 –	1,849 10 –	-- Completed season 1845–46.	—
New College at - - -	-- Altering the residency buildings to adapt them for a college.	-- Sanctioned 26th November 1846.	- - - -	5,699 1 3	6,242 8 6	-- Completed season 1847–48.	—

(continued)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839-40, to 1850-51 inclusive—*continued*.

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—GENERAL—*continued*.				*Rs. a. p.*	*Rs. a. p.*		
Dongurtal, on the road between Nagpore and Seonee: Construction of a Staging Bungalow.	For the convenience of travellers	- - Sanctioned 3d August 1840.	- - - -	1,068 5 6	1,075 6 1	- - Completed season 1841-42.	- - This route is much frequented by persons on their way to or from Bombay.
Dumow: Construction of a Dawk Bungalow and Out-offices.	- - - - - - -	- - Sanctioned 21st June 1842.	Dumow - - -	1,478 14 7	1,478 14 7	- - Completed season 1843-44.	—
Dearee: Enclosure of the Burial-ground.	- - - - - - -	- - Sanctioned 26th September 1844.	- - On the Burdwan and Benares road.	552 10 6	612 4 -	- - Completed season 1846-47.	—
CIVIL BUILDINGS, LOWER PROVINCES—GENERAL:							
Dacca College - - -	- - - - - - -	- - Sanctioned season 1842-43; estimate revised 16th October 1844.	Dacca - - -	33,707 14 -½	20,568 5 10 The Government contribution not to exceed 17,000 rupees. An additional outlay of 11,874 rupees sanctioned 16th April 1844.	- - Completed season 1848-49.	- - The additional outlay of 11,874 rupees was found necessary for the construction of a building in every respect suited to the purpose intended.
Construction of a surrounding Wall and Out-offices.	- - - - - - -	- - Sanctioned 30th September 1846.	- - - -	- - - - -			
Debrooghur Road to Jaipore: Construction of two Seraees on the.	- - - - - - -	- - Sanctioned 30th April 1845.	- - - -	3,137 - -	3,137 - - 500 - -	- Constructed season 1846-47.	—
Darjeeling: Construction of Staging Bungalows at Carrogolah Ghaut, Purneah and Kishengunge.	- - For the use of Europeans and their families proceeding from the Western stations, and from Calcutta to Darjeeling.	- - Sanctioned season 1846-47.	Darjeeling - -	7,500 - -	7,500 - -	- - - -	- - The superintendent of Darjeeling represented the very great inconvenience experienced from the want o such accommodation.
New Shingle Roof to the Church.	- - On the recommendation of a committee, who stated that the church wall threw out a green moss annually, probably owing to the leakage from the roof.	- - Sanctioned March 1847.	Darjeeling - -	650 - -	650 - -	- - Completed season 1849-50.	—
Dacca: Rebuilding the Enclosure of the old Burial-ground.	- - The old wall fell during the rains of 1845.	- - Sanctioned 23d September 1846.	Dacca - - -	680 - 8	- - - -	Season 1847-48.	—
Dum Dum: Repair of the Roman-catholic Chapel.	- - The chapel had become greatly dilapidated.	- - Sanctioned 8th September 1849.	Dum Dum - -	1,167 11 3¼	- - - -	Season 1850-51 -	- - This church was built in 1821-22, and re-roofed in 1827-28, in consequence of the timbers having been destroyed by white ants.
Renewing the Roof of the Church.	- - In consequence of the unsoundness of many of the timbers.	Sanctioned in 1851 -	- - - -	- - - - -	5,681 4 10	- - - -	- - On the present occasion saul beams will be used instead of teak, which are to be well charred or tarred at the ends; and instead of being built into the walls, they are to be placed with open spaces all round, to facilitate inspection and removal when necessary.

Darjeeling Church: Construction of a Verandah, and repairs.	- - To protect the outer walls from the constant drizzling rain.	- - Sanctioned 7th March 1851.	Darjeeling - -	- - - - - -	2,634 2 7	- - - -	- - This church was built in the year 1844, at a cost of 9,500 rupees.
CIVIL BUILDINGS, LOWER PROVINCES—POLITICAL:							
Debroo Mookh: Grant for Temporary Buildings at the new Station of.	- - This station promises to become a place of considerable trade, being particularly convenient for many of the tea localities, and for the export of grain and cotton from Mattock.	- - Sanctioned 5th February 1840.	- - The site is on the bank of the Debroo River, near its junction with a branch of the Berhampooter River, called the Mechla Gooter, three miles up from the main stream of the Berhampooter.	2,700 - -	- - - -	Season 1839–40.	—
Darjeeling: Construction of Public Buildings at the Civil Station of.	- - These consisted of a magistrate's cutcherry, a hospital, thanah, bazaar, shops, out-offices, tanks.	- - Resolution of Government, Political Department, 23d May 1838.	- - - -	15,087 5 7	- - - -	- - Completion reported season 1843–44.	—
CIVIL BUILDINGS, CENTRAL PROVINCES—POLITICAL:							
Dumoh: Construction of Buildings.	- - As quarters for the adjutant and non-commissioned officers of the 2d Police Battalion.	- - Sanctioned 11th March 1844.	Dumoh - - -	4,605 - 5	4,652 15 5	- - Completed season 1846–47.	—
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—POLITICAL:							
Delhi: Excavation of a new Tank.	- - Required in front of the Delhi Palace.	- - Sanctioned 3d February 1845.	- - On the site commonly called the Goolabaee Bagh.	25,117 7 -	22,345 3 -	- - Completed season 1846–47.	—
Delhi Palace: Repairs to -	- - - - - - - -	- Estimate submitted 27th February 1846.	Delhi - - -	6,533 12 4	50,573 - -	- - Completed season 1849–50.	- Repairs to the extent of *Rs.* 6,533. 12. 4. may have been executed, as the remainder was not considered absolutely necessary.
CANALS, SOUTH-EASTERN PROVINCES:							
Entallee Canal: Excavation of Mud from the bed of the.	- - - - - - - -	- - Sanctioned 9th January 1843.	- - - -	3,248 15 8	3,679 15 5	- - Completed season 1844–45.	—
Eastern Canals: Clearance of the Embankments.	- - To complete the tracking communication along them.	- - Sanctioned 25th September 1843.	- - - -	3,726 11 8	4,368 11 8	- - Completed season 1844–45.	—
Entallee Canal: Excavation of Deposit from the bed of the.	- - - - - - - -	- - Sanctioned 16th April 1846.	- - - -	4,470 8 -	5,172 - -	- - Completed season 1846–47.	- - The deposits which had silted up the bed of the canal have been removed, and the bed has been deepened.
ROADS AND BRIDGES, LOWER PROVINCES:							
Bridge at Ektearpore, on the road from Jounpore to Buxar.	- - - - - - - -	- - Of five arches of 20 feet span each; sanctioned 6th February 1838.	- - - -	4,197 11 6	4,197 11 6	- - Completed season 1840–41.	- - The cost of this bridge will be defrayed from the funds under the management of the local agent at Shalabad.
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—JUDICIAL:							
Etawah New Gaol: New Gaol Buildings.	- - Offices for the Magistrate and Collector.	- - Sanctioned May 1840.	- - - -	26,761 14 4	13,357 5 7	- - Completed season 1841–42.	—
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—GENERAL:							
Etawah: Construction of Staging Bungalows.	- - For the accommodation of travellers.	- - Sanctioned 7th January 1840.	Etawah - - -	4,497 - -	4,647 - -	- - Completed season 1846–47.	—

(continued)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839-40, to 1850-51 inclusive—*continued*.

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CIVIL BUILDINGS, EASTERN SETTLEMENTS—GENERAL:				*Rs. a. p.*	*Rs. a. p.*		
Eastern Settlements: Singapore	Hospital for convicts	Sanctioned June 1837	- - - -	2,670 7 9	—		
	Market at Company Glam	- - Sanctioned January 1836.	- - - -	5,703 2 4			
	Enclosure to gaol - - -	Sanctioned July 1836	- - - -	10,290 5 10			
				Rs. 18,663 15 11			
	New market at the China Town at Singapore.	- - Sanctioned September 1834.	- - - -	23,980 2 7	- - - -	Completed 1839-40 -	- - This market covers an area of twice the size of the old one, in order to meet the daily increasing necessities of the settlement.
Fish Market: Construction of a new.	- - In consequence of the present market being liable to inundation.	- - Sanctioned season 1840-41.	- - - -	2,216 2 4	- - - -	Completed 1841-42.	—
ROADS AND BRIDGES, NORTH-WESTERN PROVINCES:							
Road from Ferrah to Horal, on the route from Agra to Delhi; Estimate for Drains and Bridges.	- - - - - - - -	- - Length 102½ miles	Horal - - -	- - - - -	14,884	- - - -	- - This work has been placed in the hands of the local civil officer at Agra, and the expense will be provided for from the local funds.
Road from Ferozepore to Shikarpore.	For a military road - - -	- - Sanctioned season 1841-42. Length 415 miles.	Shikarpore - -	11,145 9 6	- - - -	Season 1841-42 -	- - The bill for the work was submitted by Captain Hatton, attached to Shah Soojah's force.
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—JUDICIAL:							
Ferozepore: Construction of a Gaol at.	- - Undertaken in consequence of the necessity of retaining a gang of convicts to supply the place of hired labourers, of whom a sufficient number for carrying on the numerous works in progress could not be obtained.	- - Sanctioned season 1846-47.	Ferozepore - -	1,402 3 5	- - - -	- - Completed season 1846-47.	—
CIVIL BUILDINGS, LOWER PROVINCES—JUDICIAL:							
Furreedpore: Additions and alterations to the Gaol.	- - To improve the salubrity of the building.	- - Sanctioned 9th April 1845.	Furreedpore - -	4,104 10 10	3,623 11 10	Season 1848-49 -	- - The floors will be built on flues four feet from the ground; some division walls, which obstruct the free circulation of air, will be removed.
CIVIL BUILDINGS, CENTRAL PROVINCES—JUDICIAL:							
Futtehpore: Construction of a Judge's Court-house and Out-offices.	- - A new court-house was much required; the records were kept in almost irreparable bungalows, and were exposed to much risk of destruction.	- - Sanctioned 22d April 1847.	Futtehpore - -	- - - - -	14,962 - -	- - - -	- - The building will be constructed of pucca materials, with flat roof, and consist of nine rooms, with a surrounding verandah.
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—REVENUE:							
Furruckabad: Construction of Tehsildarry Cutcherries.	- - - - - - - -	- - Sanctioned 11th April 1843.	- - At Terivah and Ayrwah.	At Ayrwah 3,955 3 5	8,870 4 6	- - Completed season 1846-47.	—

Futtehpore: Enlargement of the Circuit-house to accommodate the Collector and Magistrate and their Records; and construction of a Cutcherry for the Huzoor Tuhseel, and a Guard-room for 70 men.	-- This concentration of offices has been sanctioned to put an end to the existing inconvenient arrangement of these functionaries holding their offices in separate buildings, and being separated a distance of one mile from their records.	-- Sanctioned 17th August 1843.	Futtehghur - -	15,807 1 9¼	17,482 5 4	-- Completed season 1844–45.	—
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—GENERAL:							
False Point Lighthouse - -	- - - - - - - -	-- Sanctioned season 1839–40.	- - - -	-- The breakwater has been completed at a cost of *Rs.* 2,204. 6., or 296 rupees less than the amount sanctioned.	-- *Rs.* 731. 14. 5. sanctioned for plastering the building, and 2,500 rupees for a breakwater of rough stone at the eastern bund.	-- Completed season 1841–42.	-- The building is of a red colour, having a large white stone on the sea front, and is easily distinguished by passing vessels. The interior of the lighthouse has been rendered completely habitable. The breakwater was visited by the superintending engineer of the South-eastern Provinces on the 13th March 1843, and was found quite effective in preventing an encroachment of the sea.
Fakeer Point: Construction of a Lighthouse.	- - - - - - - -	-- Sanctioned 9th November 1842.	- - - -	7,082 9 10	5,000 - -	-- Completed season 1845–46.	-- The excess is owing to the necessity of providing red-stained glass and reflectors for the lantern, and other necessary items overlooked in the first estimate.
CIVIL BUILDINGS, CENTRAL PROVINCES—GENERAL:							
Futteeabad: Repairs to the staging Bungalow.	-- Considered indispensable for the superintendent of the Bhuttana territory, and the residents at Susa.	-- Sanctioned 28th March 1842.	-- Situated between Susa and Hissar.	552 15 1	- - - -	-- Completed season 1843–44.	-- This building was erected by Major Thoresby, at a cost of 2,000 rupees, and made over by him to the Government.
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—GENERAL:							
Ferozepore Burial-ground; Enlargement of the.	- - - - - - - -	-- Sanctioned 25th March 1846.	Ferozepore - -	- - - - -	3,894 2 -	—	
CANALS, NORTH-WESTERN PROVINCES—GENERAL:							
Ganges Canal - - - (*See* Appendix.)	-- For making the waters of the Ganges available for irrigation on the eastern side of the Dooab.	-- Suggested by Captain Cautley, in the year 1836.	-- To leave the Ganges at Kunkul and pass near to Meerut and Coel, and finally join the river Esau, near Mynpooree.	-- Estimates submitted in season 1841–42. *Miles.* Length of main line 453 „ of Futtehghur Branch 160 „ Boolundshuhur. 70 Etawah - 172 „ Cawnpore - 42½ 898½	-- *Rs.* 66,65,226, or *Rs.* 58,38,018. 10., exclusive of the sum which would be required for an aqueduct over the Solani River, which work may be avoided by taking a more circuitous route, and by crossing the Solani valley at a higher level.	- - - -	-- It will be necessary, first of all, to convey the water from the Ganges at Kunkul to Roorkee, a distance of 20 miles, by an expensive series of works, estimated at *Rs.* 19,64,376. 12., of which sum about 8,63,668 rupees is for the aqueduct over the Solani River. The estimate further provides for carrying the main branch from Roorkee to Chitoora, mean width of canal 150 feet; and thence to Cawnpore, 230 miles, mean width 90 feet, at a cost of *Rs.* 28,36,281. 0. 6.; and for four branch canals; viz., the Futtehghur Branch 160 miles, mean breadth 40 ¼ feet, cost 6,53,667 rupees; the Tuppul Branch 70 miles, mean breadth 26 feet, cost 1,93,746 rupees; the Shekoabad Branch 180 miles, mean breadth 38 ½ feet, cost 7,10,997 rupees; the Allahabad Branch 100 miles, mean breadth 30 feet, cost 3,06,150 rupees. A sudden stop was put to the progress of the work in 1842, the Governor-general being desirous of applying a further test to the scientific and financial calculations on which the scheme is based. This absolute prohibition was, however, partially withdrawn on the 29th June, Government being apprehensive, that if a total stop were put to the work, the money already laid out, about 1,06,000 rupees, would be to a great degree lost; and Captain Cautley was required to confine his operations from the head to the village of Noorpoor, on a line of about 100 miles. On the 7th October 1842, Government was pleased to limit the expenditure on this canal, until further orders, to two lacs (2,00,000) per annum. In July 1844, the assignment was increased to the amount of three lacs (3,00,000) per annum, to which the Court's sanction was given in their Revenue Despatch to the Government of India, dated 20th May (No. 12) 1844. The Military Board, in their annual report for the season 1850–51, stated the amount expended up to the 30th April 1850, at *Rs.* 49,48,295. 13.
Ganges Canal: Construction of a Hospital.	-- For the native establishment and workmen of the canal.	-- Sanctioned 31st December 1845.	At Roorkie - -	1,286 1 7	873 - -	-- Completed season 1847–48.	—

(*continued*)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839-40, to 1850-51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CANALS, NORTH-WESTERN PROVINCES—GENERAL—*continued.*							
Ganges Canal: Construction of an Inlet at Ranipore Rao.	- - This work is required at a point where the Ganges Canal crosses the Ranipore Rao, a mountain torrent, and is designed to overcome the difficulties arising from its position.	- - Sanctioned 16th July 1849.	- - Northern Division of the Ganges Canal.	*Rs. a. p.* - - - - - -	*Rs. a. p.* 16,202 - -	- - - -	- - The plan is to give the water of the Rao admission into the Canal by a masonry overfall. Great advantages are anticipated. The inlet will be built almost entirely of boulder masonry, faced with stone.
ROADS AND BRIDGES, SOUTH-EASTERN PROVINCES:							
Grand Trunk Road between Allahabad and Delhi: (See paras. 3 to 12 of Court's Despatch, 30th January 1850, at pages 146 and 147 of Parliamentary Return, No. 622 of 1851.)	- - Of this road only a small portion is in the South-eastern Provinces. This road may be considered as the main artery of land communication through Bengal and Hindostan.	1st Division. *Mls. fgs. ft.* - - Pultah Ghaut on the Hooghly to East Burrakur River - - - 730 4 - 2d Division. East Burrakur River to the West Burrakur River 96 2 442 3d Division. West Burrakur River to Currumnassa River - 142 - 325 4th Division. Currumnassa River to Allahabad - - - 180 6 462 5th Division. Allahabad to Bhogong, and of the Branch Road from Bhogong to Agra - - 224 7 475 6th Division. Bhogong to Ghazeeoodeennugur, and of Branch Roads from Allyghur to Agra, and from Khoorjah to Meerut - - - 254 5 510 7th Division. Meerut to Delhi, which comprises a portion of the Grand Trunk Road from Ghazeeoodeennugur to Delhi; the Grand Trunk Road prolongation, now under construction from Delhi to Kurnaul, and the new Branch Road from Meerut to Kurnaul - 179 - - From Pultah Ghaut to Kurnaul, with branches - - - 1,208 - -	- - Expenditure to 30th April 1848, 48,91,000 - -	- - The estimated amount for completion in December 1848, was *Rs.* For Roadworks - 33,02,507 For Bridge over the Soane - - - 60,00,000 For Bridge over the Jumna - - - 10,00,000 *Rs.* 103,02,507	- - - -	- - The Court, in a despatch dated 30th January (No. 2) 1850, observe, "We attach great importance to the completion of the Great Trunk Road; we desire to see it completed with substantial bridges. Those over the Soane and Jumna should be for the present suspended; but you will carefully consider whether the prospect of a railway through the North-west Provinces is sufficiently near to justify the suspension of any other portion of this great work." In season 1850–51 the formation of a firm roadway over the sandy bed of the Soane, in the 2d Division of the road, was proposed, at an estimated cost of *Rs.* 40,579. 6. 4. The breadth from eastern to western Ghaut in a straight line is 2 miles 3 furlongs and 68 yards, about 1,600 feet of which consists of shifting channels and still water, being about two miles of sandy road to be made practicable for the traffic of the country. This project contemplates a roadway of the best hydraulic concrete 3 feet deep, 12 feet broad at top, and 16 feet at base; the top surface to be level with the bed of sand, and composed of two courses of cut-stone slabs, upon a concrete base, the bed of concrete to have a slope of 2 feet at every 100 feet; an opening covered by a platform of saul wood is to be placed, fastened to longitudinal and cross sleepers, and permanently built into the concrete, to give waterway to the stream percolating through the bed. In December 1850 an outlay of *Rs.* 2,000 was sanctioned for the construction of 150 yards of causeway, on this plan, experimentally.

Continuation of, from Delhi to Kurnaul.	- - - - - - - -	- - In length 70 miles; sanctioned 19th February 1850.	Kurnaul - - -	The Earthwork, *Rs.* 32,711 5 2	4,38,076 - -	Completed 1850–51 -	- - The earthwork of the road is estimated at 43,291 rupees, the metalling at 2,51,038 rupees; the construction of 149 drain bridges and 16 masonry bridges, with 31 arches varying from 20 to 40 feet span.
Restoration of the Iron Suspension Bridge at Muggra.	- - Blown down during a storm on the 3d June 1842.	- - Length of the bridge 110 feet, and breadth 12 feet; built in the year 1830 by subscription. Its restoration sanctioned 1st August 1842.	- - Situated 7 miles to the westward of Hooghly.	- - - - - -	1,189 1 7	—	
Metalling of the portion of the, within the Benares Division.	- - - - - - - -	- - Length 4 miles, 7 furlongs; sanctioned 6th October 1846.	- - - -	- - - - - -	11,774 - -	—	
Repairs to the portion from Goopeegunge to Futtehpore.	- - - - - - - -	- - Length 114½ miles; sanctioned season 1846–47.	- - - -	- - - - - -	14,482 - -	—	
Construction of a new Masonry Bridge on the.	- - Required to replace an old one, with reference to the injury done to it by a breach near it during the heavy rains of the last season.	- - Sanctioned 8th July 1846.	- - - -	- - - - - -	2,057 9 10	—	
Construction of Wells on the	- - These wells are much required, as travellers halting at the bungalows have felt much inconvenience for the want of water.	- - Sanctioned 28th December 1846.	- - At Mirzapore and Futtehpore.	- - - - - -	1,201 6 6	—	
Raising of the Wing Walls and Parapets of Bridges, and Drains, between Futtehpore and Goorshaigunge.	- - - - - - - -	- - Sanctioned season 1846–47.	Goorshaigunge -	9,089 7 5	- - - -	- - Completed season 1846–47.	—
Renewal of a Bridge on the	- - To replace a bridge injured by a breach which occurred on the road near it, during the heavy rains of 1848.	- - Sanctioned 8th July 1846.	Grand Trunk Road -	1,791 11 11	1,791 11 11	- - Completed season 1846–47.	- - This is a bridge of two arches of ten feet span.
Iron Suspension Bridge over the Tomlah Torrent.	- - - - - - - -	Sanctioned in 1843 -	- - Situated 3 miles east of Undall.	9,168 - 10	9,168 - 10	- - Completed season 1844–45.	- - This bridge is to consist of two spans of 30 feet, and one of 90 feet, with a 16 feet roadway; and is to be constructed on the dredgian or tension principle.
Reconstruction of the -	- - - - - - - -	- - Sanctioned 15th September 1847.	- Ditto - -	9,198 12 10	9,198 12 10	- - Completed season 1847–48.	- - The bridge first constructed fell down, owing to a deficiency of waterway, and to a want of depth of foundation to the abutment piers.

(*continued*)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
ROADS AND BRIDGES SOUTH-EASTERN PROVINCES—*continued.*							
Grand Trunk Road—continued.				*Rs. a. p.*	*Rs. a. p.*		
Construction of an Iron Tension Bridge over the Noonia Nuddee.	- - - - - - - -	- - Sanctioned 31st July 1847.	- - In the district of Beerbhoom.	28,223 13 –	28,223 13 –	- - Completed season 1847–48.	- - This bridge has had some standards of stonemasonry. The centre span is 150 feet, the side spans 63·7⅞ feet; embanked approaches, neatly sloped off and turfed, lead to the bridge 1,610 feet long, and having an average height above the country of 10 feet. The embankment is supplied with two drain bridges of stonemasonry of five feet span each.
Construction of an Iron Tension Bridge over the Singharra River.	- - - - - - - -	- - Sanctioned 31st July 1847.	- - In the district of Beerbhoom.	29,733 3 6	29,733 3 6	- - - -	- - This is a similar bridge, of the same size as the former, but with masonry, part stone, part brick, with three subsidiary drains, each of 10 feet span of masonry, with embankments 2,500 feet long, and averaging 20 feet high.
Laying down Iron Tract Roads over the Noonia, Singharra, and Tomlah Bridges.	- - - - - - - -	- - Sanctioned 21st May 1847.	- - - - -	- - - - -	2,062 4 3	- - - -	- - The tracts for each will be 16 inches wide, consisting of four plates three inches broad, with intermediate spaces of 1½ inches. Four tracts will be laid for the entire length of each bridge, to admit of two wheeled vehicles passing over the bridge at the same time.
Construction of a Bridge over the Gowarree Nuddee.	- - - - - - - -	- - Sanctioned 25th September 1843.	- - In the district of Behar.	19,601 12 5½	19,601 12 5½	- - Completed season 1847–48.	- - This is a stonemasonry bridge of five arches, each 36 feet span.
Construction of a Bridge over the Danwah Nullah.	- - - - - - - -	- - Sanctioned 21st August 1843.	- - Ditto - -	16,956 12 1	16,956 12 1	- - Completed season 1847–48.	- - This is a stonemasonry bridge of four arches, each 36 feet span.
Construction of a Drain Bridge.	- - - - - - - -	- - Sanctioned 12th April 1845.	- - Situated between Barah and Muddenpore.	5,864 7 8¾	5,864 7 8¾	Completed 1847–48 -	- - This is a drain bridge of stonemasonry.
Construction of a Dawk Staging Bungalow.	To replace the old bungalow -	- - Sanctioned 24th March 1848.	At Jehanabad - -	1,648 3 8	1,648 3 8	- - Completed season 1847–48.	—
Metalling of the Road between the Raj Ghaut at Allahabad, and the Raj Ghaut at Benares.	- - - - - - - -	- - Length 75 miles; sanctioned 30th January 1848.	- - - - -	- - - - -	80,258 9 –	- - - -	- - The metal is to be spread of the average depth of 4·75 feet.
Sokoolpore: Construction of a new Bridge on the Tension principle over the Kallee Nuddee, at.	- - The old bridge was severely injured by floods on the 20th June 1842.	- - Sanctioned season 1844–45.	- - - - -	- - - - -	16,517 – –	- - - -	- - The expanse of water in the valley of the Kallee Nuddee during the flood in June 1842, extended over a breadth of 3,630 feet, and the water-way of the bridge proved insufficient for the passage of this large volume of water. The entire bed of the Nullah under the arches was swept away, and the piers of the bridge, being undermined, subsided.

Googree: Construction of a Stuging Bungalow at.	- - - - - - - -	- - Sanctioned 27th June 1846.	- - - -	2,403 7 9	2,403 7 9	- - Completed season 1846-47.	—
ROADS AND BRIDGES, LOWER PROVINCES:							
Gowahatty to the Kulling River in Lower Assam: Reconstruction of the Road.	- - This is represented to be one of the most frequented roads in Assam, and a highly important military communication, being a continuation of the road from Bengal, by Gowalparrah and the Cossyah Hills, to this Province.	- Length 33¾ miles; sanctioned 15th August 1842.	Kulling River - -	6,535 2 3	9,962 1 -	- - Completed season 1844-45.	- - In this estimate provision is made for 32 bridges of masonry, and 118 of wood. The saving on the estimate is owing to a reduction in the rate, and also in the quantity of work contemplated.
Gya Roads: Annual repairs, 1842-43.	- - - - - - - -	*Miles.* - From Gya to Jehanabad on the Patna road 30 From Gya to Shergatty on the Trunk road 22 From Gya to Surwah on the Trunk road - 20 *Miles* 72	- - - -	2,132 5 7½	1,911 6 7	- - - -	- - Of this extent of road, 15 miles are kept in repair by the Gya convicts, and accordingly provision is not made in the estimate for repairing the same.
Golar Ghaut to Bor Pathor, through Nagara.	- - The opening of this road will, it is considered, afford the most effectual means of opening an intercourse with and controlling the Nagas.	- - Length, about 30 miles; sanctioned 24th August 1844.	Bor Pathor - -	800 - -	800 - -	- - Season 1844-45.	—
Gyah Roads:							
Construction of a new line from Doobeen to Gyah.	- - It is contemplated to abandon the two existing lines of road which branch off from the Grand Trunk Road towards Gyah, the one from Shergotty, and the other from Surwah. The new line is not intersected by rivers, whereas to make the old lines practicable for wheel-carriage traffic throughout the year, it would be necessary to bridge four large rivers and four small ones, at a very considerable cost.	- - Length, about 21 miles; sanctioned 20th August 1845.	Doobeen - - - - - - - -	83,895 - -	- - Completion not reported.	- - The old line of communication from Gyah to Jenahabad (29 miles), and from Jenahabad to Patna (about 30 miles), will not be changed.
Construction of two Drain Bridges.	- In lieu of two others destroyed by floods in August 1848.	- - Sanctioned 10th October 1849.	- - On the road leading from Patna to Jehanabad. - - - - -	1,080 3 10	- - - -	- - The estimate for annual repairs, and repairing the damage done by the floods of June and August 1848, amounted to *Rs.* 3,657. 12.	
ROADS AND BRIDGES, CENTRAL PROVINCES:							
Great Deccan Road:							
Metalling of the - - -	- - In consequence of the great wear and tear on the.	- Length, 245 miles; sanctioned 28th September 1840.	- - From Telwarra Ghaut, between Jubbulpore on the Nerbudda, and Mirzapore on the Ganges.	83,924 10 5	86,826 15 4	- - Completed season 1843-44.	- - This road was originally constructed by Major Drummond. A sum of 3,180 rupees was expended on repairs to this road during 1847-48, and an estimate of *Rs.* 6,648. 11. 8. was sanctioned for the following year: on the 4th January 1850 an estimate of 25,703 rupees was sanctioned for raising and metalling the Kutchee portion of the road.

(*continued*)

No. 6.—Statement compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
Roads and Bridges, Central Provinces—*continued.*				*Rs. a. p.*	*Rs. a. p.*		
Great Deccan Road—continued. Construction of a Bridge over the Karoundah Nullah.	In consequence of the traffic of the country being much obstructed by the bed of the nullah, which is almost impassable during the rainy season.	Sanctioned 19th January 1849.		846 6 7	521 9 8	Completed season 1849–50.	This bridge is of 10 feet span.
Construction of a Stone-masonry Bridge.		Sanctioned 3d August 1848.	Across the Harzong Nullah.	639 2 9	639 2 9	Completed from 1849–50.	This is a bridge of 12 feet span.
Construction of a line of Road from the top of the Lohagee Pass to its junction with the Great Deccan Road.	This line of road is the shortest route from Allahabad to the Saugor and Nerbudda Territories, and it appears that whatever traffic exists between Allahabad and the above territories is carried on *viâ* Mirzapore, which route increases the natural distance some 70 miles.	Sanctioned 8th February 1850.	At a village called Mungowah.	36,828 9 –			The whole distance from the Great Deccan Road, near Mungowah, to the river Jumna is 58 miles, 7 furlongs, and 167 yards. Of this length 34 ½ miles have been already constructed, that is, from the Jumna to the top of the Lohagee Pass; the remaining portion is now sanctioned, including 19 viaducts.
CIVIL BUILDINGS, LOWER PROVINCES—JUDICIAL.							
Gyah: Construction of two Record Rooms.	For the records of the officers of the judge and of the collector.	Sanctioned 2d April 1837.		6,750 12 3		Completed 1840–41.	—
Gowhatty: Construction of Buildings	For a cutcherry for the collector and magistrate.	Sanctioned 4th January 1842.		6,705 3 6	6,036 5 10	Completed season 1843–44.	—
Construction of temporary Gaol Buildings.	To replace buildings burnt down on 4th April 1840.	Sanctioned 12th February 1841.		1,150 8 5	1,361 10 10	Completed season 1841–42.	—
Construction of a Record Room	For the records of the Commissioners' office.	Length 50 feet by 20 feet; sanctioned 16th January 1838.		2,526 5 7	—		
Construction of a Treasury Room.	For the use of the Commissioners' office.	Sanctioned 4th January 1841.		902 6 6		Completed season 1841–42.	—
Gowalparrah (*Lower Assam*): Construction of a Cutcherry for the Magistrate.	To replace an old cutcherry of temporary materials, which was in a dilapidated state.	Sanctioned 5th December 1837.		3,596 9 –		Completed season 1841–42.	—
Reconstruction of the Gaol Buildings.	In consequence of the decayed state of the present temporary gaol buildings.	Sanctioned 29th December 1842.		3,015 3 4	3,425 3 6	Completed season 1844–45.	—
Gowahatty: Erection of a Wall around the Gaol.	Proposed by the Commissioners, to save the expense of keeping the bamboo fences in good order.	Sanctioned 20th May 1844.	Gowahatty	2,166 6 9	2,210 10 –	Completed season 1845–46.	—
Gyah: Construction of an additional Room to the Judge's Record Office.		Sanctioned 11th September 1844.	Gyah	1,141 – 8	1,141 – 8	Completed season 1845–46.	—

Gowalparrah Gaol: Construction of Cook-rooms of masonry.	- For the convicts and their guards, in lieu of similar buildings of inflammable materials.	- - Sanctioned 6th August 1845.	Gowalparrah - -	2,812 14 3	2,812 14 3	- - Completed season 1845–46.	—
Gowahatty:							
Addition to the Commissioners' Cutcherry.	- - To afford shelter to the people attending court.	- - Sanctioned 5th November 1845.	Gowahatty - -	602 4 4	602 4 4	- - Completed season 1846–47.	—
Construction of a new Record Room for the Collector and Magistrate.	- - The necessity for this work was brought to notice by the civil authorities, who suggested that a room be built over the existing treasury and record-room.	- - Sanctioned 19th May 1847.	Gowahatty - -	3,527 12 5	3,454 7 3	- - Completed season 1849–50.	- - The estimate provides for a new building, as the house would not have borne the weight of an upper story.
Gowahatty Gaol: Construction of a Criminal Ward.	- - To replace an existing ward reported by the Commissioners of Assam to be dilapidated beyond repair.	- - Sanctioned 12th May 1847.	Gowahatty - -	- - - - -	1,768 7 6	—	
Gyah: Construction of a Cutcherry.	- For the Principal Sudder Ameen and additional Moonsiff of Behar.	- - Sanctioned 22d March 1848.	Gyah - - -	- - - - -	1,618 - -	—	
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—JUDICIAL:							
Goorgaon: Construction of a Cutcherry with Out-offices.	- - For the collector and magistrate; the construction of this cutcherry will do away with the renting of buildings, stated by the local officer to be inconvenient and ill-adapted.	- - Sanctioned 27th November 1847.	Goorgaon - -	11,188 15 8	11,465 5 8	- - Completed season 1849–50.	—
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—REVENUE:							
Gunour: Construction of a Tuhsildarry Cutcherry.	- - - - - - - -	- - Sanctioned season 1838–39.	In Zillah Budaon -	4,581 15 3	- - - -	- - Completed season 1841–42.	—
CIVIL BUILDINGS, LOWER PROVINCES—REVENUE:							
Gya: Construction of a Covered Passage from the Collector's Cutcherry to the Record Office.	- - On a representation of the Sudder Board of Revenue, to the effect that the room in which the treasurer transacted his business was inconveniently small, and that the treasury was at a considerable distance from the record office, in going to and fro, by which the Collector and his officers were exposed to rain and snow.	- - Sanctioned 5th January 1850.	Gya - - -	- - - - -	887 4 2	- - Completed season 1849–50.	- - The new passage is 340 feet by 8 feet, with wooden posts and tiled roof.
CIVIL BUILDINGS, CENTRAL PROVINCES—REVENUE:							
Ghazeepore: Construction of a Guard-room to the Collector's Cutcherry.	- - In consequence of the insufficiency of accommodation for the guard.	- - Sanctioned 25th May 1844.	Ghazeepore - -	575 4 2	575 4 2	- - Completed season 1844–45.	—
CIVIL BUILDINGS, CENTRAL PROVINCES—GENERAL:							
Ghazeepore:							
Extension of the Godown accommodation in the Opium Factory, and Bungalow for the use of the First Assistant.	- - - - - - - -	- - Sanctioned 1st May May 1839.	- Ditto - - -	11,884 - -	- - - -	- - Completed season 1841–42.	—

(continued)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839-40, to 1850-51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CIVIL BUILDINGS, CENTRAL PROVINCES—GENERAL—*continued.*							
Ghazeepore—continued.				*Rs. a. p.*	*Rs. a. p.*		
Construction of an Opium Godown at.	- - Required in lieu of one built in 1835-36, which was reported to be in ruins.	- - Sanctioned 10th September 1845.	Ghazeepore - -	2,357 8 3	2,314 14 11½	- - Completed season 1846-47.	- In 1850-51 a sum of *Co.'s Rs.* 691. 5. 8. was expended in renewing the terrace of the caking godown.
Construction of a Bungalow and Out-offices at the Opium Factory.	- - For the second assistant to the superintendent at the factory.	- - Sanctioned 17th September 1845.	- Ditto - - -	- - - - -	1,275 - -	Season 1845-46.	—
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—GENERAL:							
Great Savage Rock: Construction of a Lighthouse on the.	- - This lighthouse will enable vessels of a certain draught of water to cross the bar of the river during the night.	- - Sanctioned 9th November 1842.	- - - -	33,587 10 4	33,425 8 7	- - Completed season 1843-44.	- - The lantern was first lighted on the night of the 7th March 1844: *Rs. a. p.* Cost of lighthouse - - 33,587 10 4 Buildings attached - 1,501 9 6 Lantern - - - - - 15,000 - - *Rs.* 50,089 3 10 The total cost of the structure, including a building for establishment and stores, has been *Rs.* 50,089. 3. 10.
CIVIL BUILDINGS, LOWER PROVINCES—GENERAL:							
Ghazeepore: Enlargement of the Burial-ground.	- - The necessity of its enlargement was brought to the notice of Government by the local authorities at Ghazeepore, through the Archdeacon.	- - Sanctioned August 1843.	Ghazeepore - -	1,527 3 4	1,527 3 4	Season 1843-44 -	- - A space of 300 by 330 has been added.
Goolzarbaugh: Construction of a Boundary Wall to the Opium Godown.	- - Considered necessary for the security of much valuable property from fires and plunderers.	- - Sanctioned 3d December 1845.	Goolzarbaugh - -	4,882 14 3	5,170 - -	- - Completed season 1846-47.	—
Gyah Road: Additions and alterations to the Staging Bungalows on the.	- - With a view to assimilate them to the bungalows on the Grand Trunk Road.	- - Sanctioned 3d September 1845.	Gyah Road - -	611 - -	611 - -	- - Completed season 1845-46.	—
Gowahatty:							
Rebuilding the top of the Spire of Christ's Church.	- - Fractured by a shock of earthquake on the 18th June 1846.	- - Sanctioned 12th February 1847.	Gowahatty - -	187 7 10	200 - -	- - Completed season 1847-48.	- - Twelve zinc pipes, 2½ inches in diameter, were put up in season 1849-50, to carry the water off the roof to the ground outside the building.
Rebuilding of the Gaol Hospital.	- - Ditto - - -	Ditto - - -	- Ditto - - -	151 1 3	- - - -	- - Completed season 1847-48.	—
Gyah: Construction of an additional Opium Godown.	- - In compliance with the opinion of the Board of Customs, Salt and Opium, in regard to the necessity of the proposed outlay.	- - Sanctioned 13th March 1848.	Gyah - - -	3,907 15 7	2,776 10 3	- - Completed season 1849-50.	- - A supplementary estimate was sanctioned on the 5th February 1850, in consequence of the insufficiency of the rates assumed in the first estimate.

CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—POLITICAL:							
Gwalior Hospital - - -	- - For the sick of the escort of the Resident.	- - Sanctioned 6th April 1840.	Gwalior - - -	2,128 2 8¼	2,038 15 7	- - Completed season 1843-44.	—
EMBANKMENTS, SOUTH-EASTERN PROVINCES:							
Hidgellee:							
				- - Rough estimate for renewing and strengthening the embankments -	2,93,939 - -		- - On the 27th April 1850, whilst measures were in progress for the improvement of the embankments, Hidgellee was visited by a severe storm; the whole of the sea bunds were overtopped and extensively damaged, the country being inundated. The reconstruction of the embankments on a proper scale is being carried on (1851) with the utmost vigour under Captain Fagan, of the Engineers.
Re-construction of the Sea Bunds.	- - To protect the country from inundation.	- - Sanctioned 10th January 1851.	- - - -	- - General estimate, embracing embankments of larger section, and assuming a very low rate for the work to be executed -	5,54,255 - -	- - - -	
Embankments in the Russulpore River Frontage.	- - For the protection of large tracts of resumed lands in Hidgellee.	- - Length 56 miles; sanctioned 6th November 1841.	- - - -	- - - - -	11,648 - 11	- - - -	- - The length of the embankments in the Hidgellee division in 1839-40 was 1,046 miles, and the estimated cost of annual repairs in 1850-51 amounted to upwards of 24,300 rupees. In this division 12 sluices have been sanctioned in the Soojamote Pergunnah, which is under the management of the Court of Wards.
Construction of a new Line of Bunds in Pergunnah Khadar.	- - For the protection of the Government estate of Bolakeepore.	- - Length 2½ miles; sanctioned 25th April 1842.	- - - -	3,314 5 8	3,163 7 6	- - Completed season 1843-44.	—
Excavation of the Koonjpore and Mirzapore Khalls.	- - - - - - - -	- - Length 8 miles; sanctioned season 1843-44.	- - - -	3,645 5 9	3,680 6 2½	- - Completed season 1847-48.	- - The width of these khalls varies from 72 feet to 30 feet throughout.
Excavation of Patgoda Canal	- - - - - - - -	- - Sanctioned season 1843-44.	- - - -	- - - - -	4,030 10 -	—	
Drainage of the Jellamootah Pergunnah.	- - This work is stated to be indispensable to the prosperity of the cultivation of the Pergunnah.	- - Sanctioned 6th June 1844.	—				
Construction of a new Bund	- - To prevent the ingress of salt water to the Kusbah, which now finds its way into the cultivated lands at high spring-tides through certain low channels.	- - The new bund measures two miles and 495 feet, and its average height is nine feet; sanctioned 26th September 1844.	At Kusbah - -	- - - - -	3,300 3 2½	- - Its completion not reported.	—
Construction of new Bunds -	- - For the protection of the resumed mehals of Ustiacool and Bunderbooriah.	- - Length, four miles and five furlongs; sanctioned 15th January 1845.	- - Situated at Pergunnah Paharpore.	1,003 2 5¾	1,003 2 5¾	- - Completed season 1845-46.	—
Construction and repair of Bunds on resumed estates.	- - For the protection of resumed estates, and with a view to increased cultivation.	- - Length, three miles and one furlong; sanctioned 13th January 1845.	- - In Pergunnah Nurroomootah.	1,352 13 -	1,389 6 -	- - Completed season 1846-47.	—

(continued)

No. 6.—Statement compiled from the Reports of the Military Board at Bengal, from Season 1839-40, to 1850-51 inclusive—*continued*.

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
EMBANKMENTS, SOUTH-EASTERN PROVINCES—*continued*.				*Rs. a. p.*	*Rs. a. p.*		
Hidgellee—continued.							
Construction of five Inspection Bungalows.	For the use of inspecting officers	Sanctioned season 1849-50.	In the Hidgellee Division.	- - - - -	3,533 6 7	- - - -	The inspecting officers will be required to be constantly on the embankments, checking the works in progress, and seeing that it is fairly and efficiently executed.
CANALS, SOUTH-WESTERN PROVINCES:							
Hidgellee Canals: Deepening of a Khall leading from Tanropukeriah to Kallynuggur, on the Huldee and Russoolpore.	To facilitate the concentration of the salt of the Hidgellee Agency in one set of golahs; for this object the canal is of great importance, when the strong winds make the coast navigation dangerous.	Sanctioned 15th May 1839.	- - - -	- - - - -	23,138 - -	—	
CANALS, NORTH-WESTERN PROVINCES:							
Hallalpore and Meg Chupper: Repairs of the Falls and Bridges.	With a view to the Doab Canal being hereafter used both for irrigation and navigation.	Sanctioned season 1838-39.	On the Doab Canal -	20,725 - -	17,479 - -	Completed 1840-41 -	An excess of *Rs.* 3,247. 15. 11. has been incurred in their execution, owing to the renewal of the old bridges entirely, and a greater depth and solidity having been given to the foundations, with reference to the unfavourable nature of the soil.
ROADS AND BRIDGES, LOWER PROVINCES:							
Hajeepore to Kurrunjah, on the Mozufferpore Road.	To supersede the old road to Mozufferpore *vid* Persa Ghaut.	Estimated January 1840.	Kurrinjah - -	- - - - -	40,686 12 1	- - - -	This work does not appear to have been carried out.
Hazareebaugh: Construction of Drains, &c., on the Road from, to the Grand Trunk Road.	This road connects the military station of Hazareebaugh with the Grand Trunk Road at Barria.	Sanctioned 2d April 1841.	Grand Trunk Road -	3,707 14 8	3,753 15 5	Completed season 1841-42.	—
Hazareebaugh and Dorundah: Construction of a new Line.	To improve the facilities of communication, and will prove a great convenience to the men of the Ramghur battalion.	Sanctioned 30th August 1850; length, 62 miles, 2 furlongs, and 500 feet.	Dorundah - -	- - - - -	21,910 - -	- - - -	This is to be made a fair-weather road.
ROADS AND BRIDGES, SOUTH-EASTERN PROVINCES:							
Hazareebaugh: Construction of a Stone Bridge over the Aarah Nuddee.	- - - - - - - -	Sanctioned 16th October 1843.	- - - -	5,029 - 7	5,029 - 7	Completed season 1846-47.	This bridge has three arches of 20 feet span.
ROADS AND BRIDGES, NORTH-WESTERN PROVINCES:							
Hindun Bridge:							
Proposal for converting it into a Suspension Bridge.	- - - - - - - -	- - - - -	- - - -	- - - - -	1,45,577 10 2 Including the expense of metalling the portion of the Grand Trunk Road between the bridge and Sehinpore, near Delhi.	Completed season 1845-46.	This bridge was thrown open to the public on the 28th August 1845.

Filling up deep Pools in front and at the tail of the Bridge.	The pools were filled up with blocks of kunkur, to prevent damage to the bridge.	Sanctioned 28th May 1847.	- - - -	- - - - -	546 3 2	Completed season 1847-48.	The pooling appears to have arisen from the set of the current having turned against the eastern abutment of the bridge, and the outlay was necessary to prevent further damage.
Hydramal Bridge, over the Kallee Nuddee: Metalling the Causeway of.	The metalling had worn out, and the roadway surface had sunk generally so much as 9 inches below the mouth of the drain.	Sanctioned 14th May 1844.	- - - -	3,620 15 -	- - - - -	Completed season 1844-45.	The expenditure was incurred for carting kunkur. The labour was performed by convicts.
Hindun Causeway: Construction of a Drain Bridge under the.	Required to pass off the waters which collect in the nook or angle formed by the junction of the Meerut Road and Causeway.	Sanctioned season 1844-45.	- - - -	- - - - -	702 9 11	—	
Hurrecpore: Construction of an Iron Suspension Bridge over the Gumbleer River.	To replace a Shakespearian Bridge, reported unworthy of further repair.	Sanctioned 26th July 1844.	To be one span of 120 feet, with breadth of roadway 7 feet; situated about 6¼ miles from Subathoo.	21,712 13 3	10,721 10 6	Completed season 1847-48.	This sum exceeds the authorised estimate by about 10,990 rupees, in consequence of the necessity of restoring certain parts of the abutments and revetments, which were injured by the floods; also, in part, by carrying the foundations of the abutments to a greater depth than was originally intended, and by the construction of an additional wing wall, up-stream.
Hurdwar viâ *Roorkie to Seharunpore*, Construction of a Road.	For the good of the trading community, and for the benefit of the Ganges Canal. By the proposed road, lime, timber and bricks may be conveyed to the works on the canal.	Length, 42 miles -	Seharunpore - -	- - - - -	14,700 - -	- - - -	The Seharunpore Local Committee have assented to bear the whole cost; the money will be advanced by Government, the committee returning it by instalments of 2,000 rupees per annum. This work was projected by Lieutenant Strachey, an executive officer of the Ganges Canal, and its execution will be entrusted to him.
Hindun Bridge: Completion of the Causeway leading to the.	- - - - - - -	Sanctioned 16th March 1847.	- - - -	5,862 6 11	5,862 6 11	Completed season 1847-48.	—
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—JUDICIAL:							
Hyderabad: Conversion of an inclosure into a temporary Civil Gaol.	At the recommendation of the Governor of Scinde.	Sanctioned 8th August 1844.	Hyderabad - -	- - - - -	1,598 13 4	Not reported - -	The gaol will consist of three flat roofed wards, with guard rooms and out offices.
CIVIL BUILDINGS, LOWER PROVINCES—JUDICIAL:							
Hazareebaugh:							
Purchase of an Estate, the property of Major Bird, for a Cutcherry for the Principal Assistant Commissioner.	The existing cutcherry was represented to be quite inadequate for the accumulated records, and to be too confined for the large number of persons constantly in attendance.	Sanctioned 25th January 1841.	Hazareebaugh - -	3,500 - -	- - - -	Season 1841-42 -	The estate is beyond the limits of cantonments.
Construction of a Gaol at Hazareebaugh.	For civil and criminal prisoners -	Sanctioned 8th May 1838.	Ditto - -	4,699 7 -½	4,699 7 -½	Completed season 1842-43.	The buildings of this gaol are of a temporary nature. A hospital and wards for females are included amongst the buildings which have been constructed.
Purchase and alteration of a Bungalow as a Cutcherry for the Principal Agent, Governor-general.	Rendered necessary in consequence of the Government cutcherry bungalow having been appropriated to the use of the ex-Ameers of Scinde.	Sanctioned 24th January 1845.	Ditto - -	3,772 8 9	3,772 8 9	Season 1845-46.	—

(continued)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CIVIL BUILDINGS, LOWER PROVINCES—JUDICIAL—*continued.*				*Rs. a. p*	*Rs. a. p.*		
Hooghly Gaol:							
Supply of Water to the -	For the use of the prisoners -	-- Sanctioned 25th February 1846.	Hooghly - - -	2,082 9 4	2,184 - -	-- Completed season 1846–47.	—
Construction of two Cooking Sheds and Ventilators.	-- The removal of the present cooking sheds was necessary to prevent the escape of the prisoners; and the other sanitary works were considered essential.	- Sanctioned 21st July 1847.	- Ditto - - -	1,725 5 8	1,692 10 8	—	
Judicial Buildings - -	-- The necessity for new buildings was brought to notice by the superintending engineer.	- Sanctioned 2d September 1850.	- Ditto - - -	- - - - -	5,256 5 4	—	
Hazareebaugh: Transfer of the European Hospital to the Judicial Department.	For the confinement of prisoners	-- Sanctioned 1st December 1847.	Hazareebaugh -	- - - - -	1,889 2 11¼	- - - -	-- This arrangement will obviate the necessity there would otherwise have been to enlarge the Kishenpore Gaol.
CIVIL BUILDINGS, CENTRAL PROVINCES—JUDICIAL:							
Hoshungabad Gaol:							
Construction of additional Wards.	-- The existing buildings, for want of space, admit of no classification or internal goal discipline.	-- Sanctioned 9th March 1846.	Hoshungabad - -	6,411 3 2	6,694 - -	Completed in 1849.	--
Construction of a Hospital and additional Wards.	-- To provide additional space in consequence of frequent complaints of over-crowding.	--Sanctioned 3d July 1847.	- Ditto - -	11,539 - -	14,673 - -	-- Completed in season 1850–51.	--Notwithstanding the accommodation afforded by the two new wards, completed in 1849, the increase of number above accommodation had been such that scurvy and other gaol diseases had been generated, and had occasioned a heavy monthly mortality.
Hoshungabad: Restoration of the Peshkarree Cutcherry.	-- This cutcherry was destroyed by fire on the 27th May 1846.	-- Sanctioned 2d February 1847.	- Ditto - -	580 - -	- - - -	Season 1847–48.	—
CIVIL BUILDINGS, CENTRAL PROVINCES—REVENUE:							
Hoshungabad: Construction of a Peeskar's Cutcherry.	- - - - - -	- Sanctioned 26th December 1838.	- Ditto - -	1,074 8 6	- - - -	-- Completed season 1841–42.	—
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—GENERAL:							
Howrah: Extension of the Burial-ground.	- - - - - -	-- Sanctioned 14th March 1842.	Howrah - - -	855 - 6	- - - -	-- Completed season 1842–43.	-- A space of about 175 × 170 has been taken in and enclosed.

CIVIL BUILDINGS, LOWER PROVINCES—GENERAL:							
Hooghly River: Construction of two Obelisks on the.	-- The actual necessity of these beacons was pointed out by the marine authorities.	-- Sanctioned 20th May 1844.	-- One at Canterbury Point, the other at the mouth of the Hog River Creek.	1,237 4 10½	2,003 12 5	-- Completed season 1845-46.	-- The obelisk at Canterbury Point is to be 50 feet, and that at Hog River Creek 40 feet in height.
CIVIL BUILDINGS, CENTRAL PROVINCES—GENERAL:							
Hattrass: Repairs and improvements to Hardingunge.	- - - - - - -	-- Sanctioned 26th July 1841.	Hattrass - - -	3,339 15 7	4,006 1 7	-- Completed season 1843-44.	—
CIVIL BUILDINGS, LOWER PROVINCES, POLITICAL:							
Hazareebaugh: Repair of Buildings.	-- Purchased for the accommodation of the ex-Ameers of Scinde.	-- Sanctioned 17th January 1845.	- - - -	529 5 8	529 5 8	-- Completed season 1845-46.	—
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—POLITICAL:							
Hawalleagh: Purchase of three Bungalows.	For exiled Hill Ryots - -	--Sanctioned 23d August 1849.	Hawalleagh - -	2,700 - -	—		
CANALS, NORTH-WESTERN PROVINCES:							
Intally Canal: Excavation and clearance of.	- - - - - - -	-- Sanctioned 14th April 1840.	- - - -	3,466 9 5	-- An estimate for its clearance, amounting to *Rs.* 5,151. 12. –, sanctioned 20th February 1851.	-- Completed season 1840-41.	—
EMBANKMENTS, SOUTH-EASTERN PROVINCES:							
Jeekoorkhally: Construction of a New Line of Dobundy in the Dooroo Pergunnah.	-- For the safety and protection of the country, the existing bund having been encroached on by the sea.	-- Length, 1 mile and 400 feet; sanctioned 15th May 1849.	- - - -	- - - - - -	863 4 3	- - - -	-- It would seem advisable to throw the embankments back at least 1,000 yards from Kumarpore or Joonpoot to a point north of Singaree.
Jumna River - - - -	-- Improvements to the navigation of the.	—					
Plantations on the Banks of the Canals west of the Jumna River.	- - - - - - -	-- From 1830 to 1st January 1841.	Jumna Canals - -	4,10,626 - -	-- Since 1830 an average yearly outlay of 2,000 rupees has been incurred in rearing plantations. The amount realised by the sale of cuttings from these trees has been 19,906 rupees, and the amount expended, 22,426 rupees.	- - - -	-- They consist chiefly of babool, toon, saul, and sissoo, which, when they arrive at maturity, will yield a very profitable return.
Plantations on the Banks of the Eastern Jumna Canals.	- - - - - - -	-- Sanctioned 14th November 1849.	Jumna Canals - -	3,000 - -	3,000 - -	Season 1849-50 -	-- The total amount of expenditure up to the 30th April 1849 was *Rs.* 27,865. 5. 9., and the amount realised from the sale of the produce, *Rs.* 20,646. 15. 9.; the estimated value of the trees on the banks of these canals was *Rs.* 1,48,408. 8. –., the number of trees, 290,817, of different ages.

(*continued*)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive—*continued*.

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
EMBANKMENTS, SOUTH-EASTERN PROVINCES—*continued*.				*Rs. a. p.*	*Rs. a. p.*		
Jumna Bund: Repair and extension of the.	-- For the purpose of relieving the Jumna New Cut and Bund from a portion of the flood-water, and clearing out the mouth of Blane's Cut.	- Sanctioned 3d April 1837.	- - - -	Not reported - - -	10,363 11 1	—	
ROADS AND BRIDGES, SOUTH-EASTERN PROVINCES:							
Juggernauth Road - -	- - - - - - - -	- Length, 261 miles; extends from the Old Benares road at Jellalabad *viâ* Midnapore to Pooree.	—				
Repairs to the Ghoree Khall Suspension Bridge on the.	- - - - - - -	- Built by Lieutenant Schalch many years ago; repairs sanctioned 20th July 1841.	-- In the Balasore Division.	3,088 14 6½	2,773 - -	-- Completed season 1844–45.	-- The standards have given way, and the failure is ascribed either to the masonry on which the ground links are built having sunk and allowed the chain to come forward, or to the ground links not having been firmly built into the masonry at first.
Repairs to the Foolnackra Bridge, in the Cuttack Division of this road.	-- Damaged by a flood on the 2d October 1842.	- Sanctioned 5th June 1843.	- - - -	1,399 11 9	1,399 11 9	-- Completed season 1843–44.	—
Construction of a Drain Bridge in the Balasore Division at Ummerrah.	-- To supply the place of a four feet drain, which was carried away by a flood in September 1841.	-- The new drain is of 8 feet span.	- - - -	579 10 7	- - - -	-- Completed season 1842–43.	—
Renewal of the wood-work of the Iron Suspension Bridge at Kuddum Khandee.	- - - - - -	- Sanctioned 3d October 1842.	- - - -	886 11 5	992 2 1	-- Completed season 1843–44.	—
Construction of a new Drain Bridge on the.	-- This drain is much required at the spot, which is cut every year by the ryots to let off the water from their fields.	- Sanctioned 23d October 1843. This bridge is to be of 8 feet span.	At Dysurrah - -	313 3 3	313 3 3	-- Completed season 1843–44.	—
Construction of a New Bridge near the present Noomajoory Bridge.	-- With a view to the preservation of the Juggernauth Road, which, at the site fixed on for the new bridge, was constantly liable to be cut through by the floods of the country.	-- Sanctioned 27th August 1844.	- - - -	11,094 2 4	16,856 4 9	-- Completed season 1846–47.	-- This is a bridge of five arches, viz., two of 22 feet, two of 24 feet, and one of 26 feet span. A saving of *Rs.* 5,762. 2. 5. has been effected by a reduction in the quantity of masonry, as well as in the rates assumed in the estimate.

Repairs to, in the Balasore Division.	In consequence of heavy damage sustained by floods.	Length about 3½ miles; sanctioned 27th February 1845.	Between Goreekhaul and Rajghaut.	1,404 9 11	1,404 9 11	Season 1845-46.	—
Construction of a Drain Bridge on the.	The road was every year cut through by the ryots, to let the water off their fields; this practice, it is hoped, will be put a stop to.	Of eight feet span; sanctioned 23d October 1843.	At Dysurrah	302 8 5	302 8 5	Constructed season 1843-44.	—
Construction of a Drain Bridge on the.	With a view of bringing the water into the villages, instead of allowing it to be carried off to a different direction.	Sanctioned 26th April 1844.	At Khurruckpore	243 5 11	243 5 11	Season 1844-45.	—
Construction of two Bridges	For drainage	Sanctioned 8th September 1847.	At Rajghaut	777 15 10	Not stated	Completed season 1849-50.	Each of two arches of 10 feet span.
Annual repairs from Pooree to Rajghaut, and the Cross Road towards Jehajpore; also for Bridges, Drains, and Serais.	The preservation of the road	Length 183 miles 3 furlongs and 100 yards; and of the cross road 4 miles and 6 furlongs.			5,826 3 3	Annual repairs for season 1849-50.	These bridges, &c., will be on the south side of the Soobunrukah River.
ROADS AND BRIDGES, NORTH-WESTERN PROVINCES:							
Joah Bridge, under the city of Bareilly, on the road to Moradabad.					15,702 – –		A wealthy native gentleman, Dewan Behadoor Sing, offered to defray the cost of this bridge, which had been taken out of the hands of the executive engineers.
Jyaree: Construction of an Iron Suspension Bridge on the taper chain principle, over the Kossillah River, at.	In lieu of a bridge which was carried away in September 1840, by a sudden rise of the river.	Sanctioned 5th April 1842.	Jyaree	10,543 – –	8,581 8 3	Completed season 1846-47.	This bridge is to consist of five arches of 20 feet span each, with piers 20 feet high.
ROADS AND BRIDGES, LOWER PROVINCES:							
Jamalpore: Construction of Drain Bridges at.		Sanctioned 10th May 1844.	Jamalpore	950 9 9		Completed season 1844-45.	—
Jaipore to Ningroo: Opening of a Road.	Military posts having been established at these places, it has been found necessary to open a temporary communication between them.	Length 27 miles; sanctioned season 1844-45.	Ningroo	1,075 8 5	989 – –	Constructed season 1845.	The road has been merely cleared of the jungle, so as to admit the passage of troops.
ROADS AND BRIDGES, CENTRAL PROVINCES:							
Jubbulpore to Mirzapore, or the Great Deccan Road:							
Metalling of the	In consequence of the great wear and tear on this road.	Length 245 miles; sanctioned 28th September 1840.	From Tilwarra Ghaut, between Jubbulpore on the Nerbudda, and Mirzapore on the Ganges.	83,924 10 5	86,826 15 4	Completed season 1846-47.	This road was originally constructed by Major Drummond.

(*continued*)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839-40, to 1850-51 inclusive—*continued*.

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
ROADS AND BRIDGES, CENTRAL PROVINCES—*continued*.				*Rs. a. p.*	*Rs. a. p.*		
Jubbulpore to Mirzapore, or the Great Deccan Road—continued.							
Annual repair to the metalled portion of.	- - - Also for making wooden bridges, &c.	- - Sanctioned 30th November 1842.	Mirzapore - -	For bridges - *Rs.* 2,448 For repairs - 2,708 *Rs.* 5,156	5,168 3 8½	- - Completed season 1846-47.	- - This estimate also provides for the construction of 15 wooden bridges on the road connecting Jokehia and Dumoh, and clearing the Nuddee Ghauts.
Jubbulpore viâ *Seonee to Kamptee*: Proposed metalling and partial bridging of the road.	- - To continue the great road from Mirzapore to Jubbulpore (or Great Deccan Road).	Length: *M. f. yds.* Jubbulpore to Seonee 83 7 32 Seonee to Kamptee 63 7 96 *Miles* 148 0 0 With reference to the magnitude of the outlay contemplated, its commencement has been deferred until the estimates have been reported on by the superintending engineer, after personal inspection.	Kamptee - -	- - - - -	1,76,246 - - 61,500 - - *Rs.* 2,37,746 - - Exclusive of the item of bridges.	- - - -	- - *Rs.* 20,010. 5. 6¼. were expended in season 1847-48 in cutting jungle, making proper inclined ghauts, and clearing and smoothing the surface of the ghauts; an advance of 16,000 Company's rupees was sanctioned for the earthwork of the portion of the road in the Nagpore territory, and *Rs.* 24,180. 8. 10. for earthwork between Jubbulpore and Seonee.
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—JUDICIAL:							
Intally: Purchase of Ground -	- - For the sheds of the conservancy department.	- Sanctioned 2d April 1839, and 23d June 1840.	Intally - - -	7,000 - -	- - - -	Season 1840-41.	—
CIVIL BUILDINGS, LOWER PROVINCES—JUDICIAL:							
Jessore: Construction of a flat-roofed Cutcherry.	- - For the two Principal Sudder Ameens, to enable them to give up the rooms in which they at present hold their cutcherries for the custody of the records of the Judge and Magistrate.	- - Sanctioned 2d May 1842.	Jessore - - -	2,696 5 3½	2,860 14 5	- - Completed season 1844-45.	- - The cutcherry is to be flat-roofed, with tiled verandahs.
Jessore Gaol: Construction of 12 Necessaries.	- - - - - - -	- - Sanctioned 25th January 1843.	Jessore - - -	1,234 8 1	1,113 12 6	- - Completed season 1844-45.	—
Jessore:							
Cutcherry for the Sudder Ameen.	- - - - - - -	- - Sanctioned 27th February 1843.	Jessore - - -	2,696 5 3½	3,657 10 9	- - Completed season 1844-45.	—

Construction of a Selakhana	- - For the reception of property recovered in cases of dacoity, burglary, &c., and in lieu of an old building inconveniently situated.	- - Sanctioned 28th February 1844.	- - The new building will be erected close to the magistrate's cutcherry.	764 3 5	823 11 10	- - Completed season 1844-45.	—
Jessore Gaol: Construction of a Dead-house and Dispensary.	- - - - - - -	- - Sanctioned 27th May 1846.	Jessore - - -	588 4 5¾	- - - -	- - Completed season 1847-48.	—
Jamalpore: Alterations to the Deputy Magistrate's Cutcherry.	- - In consequence of the wood work of the roof having become entirely decayed.	- - Sanctioned 22d December 1849.	Jamalpore - -	1,459 1 -	- - - -	- - Completed season 1849-50.	- - The cutcherry has been put into thorough repair.
CIVIL BUILDINGS, CENTRAL PROVINCES—JUDICIAL:							
Jubbulpore:							
Construction of a new Gaol -	- - For the accommodation of 300 prisoners.	- - Sanctioned 10th March 1841.	Jubbulpore - -	16,044 11 9	15,541 11 1	- - Completed season 1842-43.	—
Construction of Public Buildings.	- - For the 1st battalion of military police.	- - Sanctioned 14th August and 13th October 1843.	- - - -	2,411 7 -¼	2,805 8 7	- - Completed season 1844-45.	—
Construction of a new Gaol Hospital.	- - Under a representation that the gaol hospital was not a fit receptacle for the united Thug and Zillah sick prisoners.	- - Sanctioned season 1844-45.	- - - -	8,765 5 3	8,076 7 5	- - Completed season 1846-47.	—
Jaunpore: Construction of a Court-house.	- - For the Collector and Magistrate.	- - Sanctioned 25th November 1850.	Jaunpore - - -	- - - - -	6,994 - -	—	
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—GENERAL:							
James Prinsep Ghaut: Contributions towards the erection of.	- - To be erected with the aid of Government, by the inhabitants of Calcutta, to the memory of the late James Prinsep, Esq.	- - Sanctioned 1840-41	- - To be erected in a situation highly useful for the embarkation or disembarkation of European troops.	Donation, season 1840-41 23 Nov. 1842, flag-stones contributed towards its erection to the value of 3 July 1843, a further grant authorised of	10,000 - - 600 - - 2,756 - - *Rs.* 13,356 - -	- - - -	- - On the 3d July 1843, the completion of the work devolved on the garrison engineer of Fort William, who, it was understood, had been provided with funds sufficient for that purpose.
CIVIL BUILDINGS, LOWER PROVINCES—GENERAL:							
James and Mary's Anchorage Creek: Construction of an Obelisk at the.	- - The spot is most dangerous for navigation; the obelisk is intended as a day beacon.	- - Sanctioned 25th March 1843.	- - Situated below Fultah, on the Hooghly River.	2,642 10 4¾	1,861 - 10	- - Completed season 1843-44.	Its height will be 80 feet.
CIVIL BUILDINGS, CENTRAL PROVINCES—GENERAL:							
Inathowna: Construction of a Staging Bungalow at.	- - - - - - -	- - Sanctioned 7th May 1843.	- - Situated between Sultanpore and Benares.	- - - - -	1,881 4 8	Season 1843-44 -	- - This bungalow will be constructed from the funds originally granted for the bungalow at Benares, a bungalow at the latter place being under construction from funds collected by private subscription.
Jugadaree: Erection of a Staging Bungalow and Out-offices.	- - - - - - -	- - Sanctioned 9th September 1843.	- - Situated between Umballah and Kheree.	3,244 10 6	2,243 10 9	- - Completed season 1846-47.	—

(*continued*)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839-40, to 1850-51 inclusive—*continued*.

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CIVIL BUILDINGS, JHULLUNDHUR DIVISION—GENERAL:				*Rs. a. p.*	*Rs. a. p.*		
Jullundur:							
Construction of a Cutcherry and Guard-room.	- - For the deputy commissioner of the station.	- - Sanctioned 31st August 1847.	Jullundhur - -	26,729 11 –	- - - -	- - Completed season 1850-51.	- - The old fort at Jullundur, formerly used as a cutcherry, has been sold for 40,000 Company's rupees.
Construction of a Dâk Bungalow and Offices.	- - On the recommendation of the Postmaster-general, North-Western Provinces.	- - Sanctioned 4th January 1850.	- - - -	- - - - -	3,869 15 3	Season 1849-50 -	- - The expense will be defrayed from the North-Western Provinces Staging Bungalow Fund.
CANALS, SOUTH-WESTERN PROVINCES:							
Kamapookreah Khal: Repair of the Dam across the mouth of the.	- - - - - - -	Sanctioned 1840-41	- - - -	813 15 6	825 – –	- Repairs completed 1841-42.	- - The total sum expended for this work since its commencement is 2,945 rupees.
CANALS, SOUTH-EASTERN PROVINCES:							
Kotakhally Nullah, in Chittagong: Excavation of the.	- - - - - - -	- - Sanctioned 29th May 1838.	- - - -	1,224 9 11	- - - -	- - Completed season 1841-42.	—
Khattee Canal: Repair and improvement of.	- In consequence of the abandonment of the Oolabarreah Canal.	- - Sanctioned 12th February 1845.	- - This canal is a communication between the Damoodah and Hooghly Rivers.	2,000 – –	2,000 – –	- - Completed season 1845-46.	—
Khattee Bund: Raising of the, two feet.	- - To bring it above the level of the inundations which occurred in August 1844.	- - Sanctioned 27th May 1845.	- - - -	- - - - -	2,568 3 6	- - - -	- - The greatest part of the earth for this work will be dug out from the Khattee Canal, the improvement of which will thus be effected at little or no expense.
CANALS, NORTH-WESTERN PROVINCES:							
Kunjnoon Escape Nullah -	- - Construction of a masonry bridge across the.	- - Sanctioned 4th April 1836.	- - Near the village of Nakroan.	2,142 – –	2,142 – –	- Constructed season 1846-47.	- - This bridge has timber road-way on masonry piers and abutments.
Kutta Puther Canal - -	- - For the purpose of irrigating a tract of country bounded by the Jumna on the west, by the Asum on the south, by the hills on the north, and on the east by a stream called the Sutwala Raos.	- - Sanctioned 4th February 1848.	- - - -	- - - - -	88,902 11 1	- - - -	- - This tract of land to be irrigated contains 20,254 acres (31 square miles), more than four-fifths of which is good land for cultivation.
Kallee Nuddee: Iron Suspension Bridge at Khodagunge, between Cawnpore and Furrackabad.	- - - - - - -	- - - -	- - - -	- - - - -	- - - -	- - - -	- - Was built by the late Nuwab Mehindie Allee Khan Bahadoor, but having been made over to Government by his nephew, Ahmed Allee Khan Bahadoor, orders have been given to provide for its future repair.

Kumaon: Construction of a Bridge on the taper chain principle over the Kosillah River.	The old bridge was injured by a sudden and unusual high rise of the river in September 1840.	Sanctioned 5th April 1842.	At Jyaree	5,609 4 8	9,170 13 1	Completed season 1842–43.	—
Kathur Nuddee: Bridge near Subathoo.	To replace an old bridge which was represented to be unsafe for travellers.	Sanctioned season 1841–42; a revised estimate sanctioned 19th July 1844.	On the road from Subathoo and Simla.	940 11 6	420 5 7	Completed season 1844–45.	This bridge was totally destroyed by the storms which occurred between the 17th and 20th July 1844. It will not be restored.
ROADS AND BRIDGES, LOWER PROVINCES:							
Kubbadduck River: Suspension Bridge over the, on the tension principle of Mr. Dredge, of London.	- - - - - - -	Sanctioned 28th February 1841.	Near Jessore	21,056 – 3	22,818 13 4	Completed in 1846	A wealthy native gentleman, by name Kallee Podar, has made an offer to Government to defray half the cost of this bridge. This bridge had been but recently constructed and reported upon (on the 26th August 1846) by a special committee, and while their report was under consideration, accounts were received of its failure on the 30th September 1846, with a loss of 150 lives, in consequence of the whole structure having been thronged with natives witnessing the passage of the Doorgah under the bridge. The estimate for the restoration of the bridge amounts to 5,426 rupees. The Court, in their despatch to the Government of India, dated the 29th September (No. 25) 1847, reiterated their orders of 1845, forbidding the further adoption of the tension principle in the construction of suspension bridges. *See* Ballee Khal Bridge. This bridge was reconstructed at a cost of *Rs.* 7,722. 1. 10.; the total expenditure incurred, including the cost of testing the bridge, had been *Rs.* 31,044. 9. 8. A committee of engineer officers was assembled to report on the bridge after its reconstruction; and their report, dated the 24th February 1849, shows that the bridge had been fully tested, and that it is capable of bearing, with perfect safety, the traffic of the country. The bridge has been opened to the public and to the passage of all traffic, excepting elephants. On the 27th June 1849 a report was received from the officiating superintending engineer, Lower Provinces, of the partial failure of the structure, on which Captain Guthrie, of the Engineers, was ordered to inspect the bridge and report the causes of the failure. The following paragraph is extracted from his report, para. 14.:—"I await further orders regarding this bridge. I have issued no orders regarding closing it; having stood the test of 70 lbs. to the square foot, it must be fully equal to all ordinary traffic. I have, however, directed the chowkeedar to prevent crowds from assembling, and trains of carts from passing both ways at the same time."
Kamroop: Construction of Bridges on the Mofussil roads in the district of Kamroop, and the town of Gowahatty.	- - - - - - -	Sanctioned 12th September 1842.	- - - -	1,839 14 5	- - - -	Completed season 1842–43.	The amount will be charged partly to the Town Improvement Committee funds, and partly to the Mofussil Road funds.
Koliabur to the Dunsurry River	The construction of this road will complete the direct communication between Upper and Lower Assam.	Length 67 miles 1 furlong; sanctioned 4th December 1844.	Dunsurry River	Not reported - -	24,500 2 2	- - - -	The construction of 240 drain bridges on the line is provided for in the estimate.
Kulling River to Koliabar: Repair of the Road.	This road follows the course of the river, and forms a bund to keep out inundation.	Length 72 miles	Koliabar	6,212 – –	6,212 – –	Completed season 1844–45.	—
ROADS AND BRIDGES, SOUTH-EASTERN PROVINCES:							
Khoorda Road; Repairs to, and clearance of jungle on.	- - - - - - -	Length of road 69 miles, 5 furlongs and 115 feet; repairs sanctioned 24th November 1840.	Extends from the Madras frontier to Cuttack.	- - - - -	11,459 10 –½	—	
Construction of 129 Bridges and Drains on the.	To facilitate the means of communication.	Sanctioned season 1839–40.	- - - -	49,702 8 5	60,673 3 6	Completed season 1845–46.	The saving of *Rs.* 10,970. 11. 1. is owing to a reduction of rates, and also to the quantity of masonry.

(*continued*)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839-40, to 1850-51 inclusive—*continued*.

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
ROADS AND BRIDGES, SOUTH-EASTERN PROVINCES—*continued*.				*Rs. a. p.*	*Rs. a. p.*		
Kyook Phyoo: Construction of five first-class masonry Bridges.	- - - - - - -	- - Sanctioned 18th September 1841.	Kyouk Phyoo - -	10,518 14 10	11,356 7 1	- - Completed season 1842-43.	—
Khoorda Road: Construction of large Bridges on the.	- - Required over rivers that intersect the road.	- - The length of the Khoorda Road is 69 miles, 5 furlongs and 115 feet; sanctioned 25th September 1844.	- - One over the Coosmy River; one over the Sahal River; one over the Consail River.	- - - - - - - - No report of the final completion of these bridges has been received - - - - - -	6,970 14 1 9,663 9 2 30,333 - -	- - - -	- - For a bridge of seven arches and 20 feet span over the Coosan River. - - For an iron suspension bridge of eight feet span over the Sahah River. - - For a bridge on the tension principle over the Consail River.
Kyook Phyoo: Construction of two Sluices with self-acting gates to bunds.	- - For keeping out the salt water from the station.	- - Sanctioned 15th April 1846.	Khyook Phyoo -	1,828 4 -	1,451 - -	- - Completed season 1845-46.	—
Construction of 12 pucca Drain Bridges.	- - These works were undertaken at the requisition of the Commissioner of Arracan.	- - ditto - -	At Mugh Bazar -	- *Rs.* 1,217. 15. 7. for nine bridges in 1847-48; the three remaining bridges of the 12 authorised were completed in season 1849-50.	1,361 - -	—	
Construction of four Drain Bridges.	- - - - - - -	- - ditto - -	At Khyook Phyoo -	- - - - - -	1,348 - -	—	
Kedgeree Dâk Road: Renewal of Wooden Bridges over the Kolah Khallee and Tangooah Khalls.	- - To replace the present structures, which are in a decayed and dangerous condition.	- - Sanctioned 17th March 1847.	Kedgeree Dâk Road	4,009 7 10	2,230 1 1 1,779 6 9 *Rs.* 4,009 7 10	- - Completed season 1847-48.	- - The bridge over the Kolah Khallee is to be of 70 feet span; that on the Tangoah Khall of 60 feet span.
Kyook Phyoo: Construction of a masonry Sluice.	- - - - - - -	- Sanctioned season 1849-50.	- - The sluice is constructed in Jopphoe's Bund.	570 10 7	- - - -	- Constructed season 1849-50.	This sluice has a self-acting gate.
Kyook Phyoo: Construction of a new masonry Bridge called Budder Mokane Bridge.	- - Constructed on the requisition of the local authorities, the old bridge having fallen down.	- - ditto - -	- - - -	567 - -	- - - -	- - ditto - -	This bridge is of 8 ½ feet span.
ROADS AND BRIDGES, UMBALLA DIVISION:							
Kalka to Dugshye - - -	- - With reference to the formation of a new cantonment on the hills at Dugshye, the road from Kalka at the foot of the hills will be extended to Dugshye.	- - Length 18½ miles; sanctioned 28th April 1847.	Dugshye - -	- - - - -	1,20,250 - -	- - - -	- - Up to the 1st April 1848, a sum of *Rs.* 45,068. 1. 3. had been expended on the work, the progress of which has also been assisted by three or four companies of the corps of Sappers and Miners.
CIVIL BUILDINGS, LOWER PROVINCES—JUDICIAL:							
Kyouk Phyoo: Construction of a Cutcherry Bungalow at.	- - To be used either by the assistant at Aeng, or by the commissioner.	- - G. O., 26th September 1839.	Kyouk Phyoo -	7,426 5 8	5,335 9 8	- - Completed season 1842-43.	- - The whole, or nearly so, of this excess has been expended on works not included in the original estimate.

Koosbaugh, near Moorshedabad: Repairs to buildings at the Mausoleum of Mohabut Jung.	- - - - - - -	- - Sanctioned seasons 1840-41 and 1841-42.	Koosbaugh - -	2,308 10 6	2,308 10 6	Season 1841-42.	—
Kishenagur Gaol: Erection of a Dead-house.	- - - - - - -	- - Sanctioned 23d November 1846.	Kishenagur - -	417 11 4	- - - -	- - Constructed season 1847-48.	—
Khoolna: Construction of a Cutcherry and Dwelling-house for the Joint Magistrate.	- - The construction of the building was rendered unavoidable in consequence of a tendency to outrage and disturbance existing in that quarter, which called for the constant presence of a joint magistrate.	- - Sanctioned 3d June 1844.	Khoolna - - -	6,796 11 10	7,150 8 9	- - Completed season 1845-46.	—
Kissenpore Gaol: New Tile Roofing to the.	- - The gaol had heretofore been thatched, but a thatched roof, from its liability to take fire, was considered particularly objectionable for a gaol.	- - Sanctioned 16th September 1844.	Kissenpore - -	2,066 5 11	2,616 4 3	- - Completed season 1846-47.	—
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—JUDICIAL:							
Kyouk Phyoo:							
Addition of Out-offices to the New Circuit-house.	- - - - - - -	- - Sanctioned 5th October 1841.	- - - -	1,082 3 3	1,082 - 3	- - Completed season 1842-43.	—
Construction of new Gaol Buildings.	- - The old gaol wards were quite unworthy of further repairs.	- - Sanctioned 31st July 1843.	Kyouk Phyoo - - - - - - -		20,867 5 2	—	
Construction of a Sudder Hospital.	- - Indispensably necessary for the accommodation of the sick of the police, the flotilla, and other civil establishments.	- - Sanctioned 24th June 1844.	- - - -	1,753 10 6	1760 5 -	- - Completed season 1845-46.	—
Construction of two new Wells for the gaol.	- - - - - - -	- - Sanctioned 31st July 1843.	- - - -	517 5 9	517 5 9	- - Constructed season 1845-46.	—
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—JUDICIAL:							
Kumaon: Construction of a Cutcherry.	- - For the accommodation of the junior Assistant Commissioner and Suddur Ameen.	- - Sanctioned 7th July 1841.	- - - -	685 1 3	779 15 -	- - Completed season 1841-42.	—
Kuchwagur: Construction of Police Guards.	For prisoners under trial - -	- - Sanctioned 27th April 1844.	Kuchwagur - -	2,200 - -	2,200 - -	- - Constructed season 1844-45.	—
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—REVENUE:							
Kyouk Phyoo:							
Construction of masonry Sluices with self-acting gates.	- - In compliance with the recommendation of the Commissioner of Arracan.	- - Sanctioned 4th March, and 20th May 1846.	- - In Freeman's Bund, at Kyouk Phyoo.	2,577 2 11	2,577 2 11	- - Completed season 1847-48.	—
Construction of a masonry Sluice with self-acting gate.	- ditto - - - -	- - Sanctioned 15th April 1846.	- - In Hopkinson's Bund, at Kyouk Phyoo.	982 1 11	982 1 11	- - Completed season 1847-48.	—

(continued)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—REVENUE—*continued.*				*Rs. a. p.*	*Rs. a. p.*		
Kyouk Phyoo—continued.							
Construction of a masonry Sluice with self-acting gate.	-- In compliance with the recommendation of the Commissioner of Arracan.	-- Sanctioned 4th March 1846.	-- In the Fish Village Bund.	598 14 9	598 14 9	-- Completed season 1847–48.	—
Construction of a Sluice Bridge called Chota Nemuch Gollah.	-- With the view of improving the salubrity of the station.	-- Sanctioned May 1847.	Kyouk Phyoo - -	860 - 4	860 - 4	-- Constructed season 1849–50.	-- This work was projected by the Commissioner of Arracan.
New Sluice in Freeman's Bund - - - - - - -		-- Sanctioned season 1849–50.	- - - -	949 9 4	949 9 4	-- Constructed season 1849–50.	-- The sanction for this work was obtained from the Government, direct by the Commissioner at Arracan.
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—GENERAL:							
Kedgeree Tripod - - -	-- For the security of the establishments at Kedgeree, as well as of the inhabitants, in the event of a gale occurring similar to that in 1833.	-- The fabric will be 50 feet high, and of four stories; sanctioned 27th January 1840.	Kedgeree - -	4,189 11 -	4,214 9 9	-- Completed season 1841–42.	-- Three of the stories will be for places of refuge in times of inundation, and the fourth may be used by the Semaphore establishment, and also for the purpose of exhibiting a light, if necessary, for the use of the shipping.
Kidderpore: New Fitting Shop in the Steam Dockyard.	- - - - - - -	-- Sanctioned season 1838–39.	- - - -	12,945 - 1	- - - -	-- Completed season 1841–42.	-- The work has been satisfactorily executed.
Kedgeree: Enclosure of the Burial-ground.	-- The place was represented to be a perfect jungle, without any surrounding wall, hedge, or fence of any kind whatever.	-- Sanctioned 26th April 1842.	- - - -	754 12 11½	796 5 -	-- Completed season 1843–44.	—
Kyouk Phyoo:							
Construction of Godowns -	For marine stores - - -	-- By order of the Commissioner of Arracan, dated 17 February 1840.	Kyouk Phyoo - -	2,550 3 10	- - - -	-- Completed season 1841–42.	-- These buildings replaced two others which had been pulled down.
Construction of a new Marine Magazine.	-- The old building has been in a state of dilapidation since 1838.	-- Sanctioned season 1842–43.	Kyouk Phyoo - -	1,798 9 2	- - - -	-- Completed season 1842–43.	—
Kootubdea Island: Construction of a Lighthouse, &c.	- - - - - - -	-- Sanctioned 11th January 1843.	Kootubdea Island -	35,511 - -	39,235 6 5	-- Completed 21st February 1846.	-- The light will be exhibited 100 feet above high water spring-tides, and the lantern is to be 12 feet in diameter.
Kidderpore:							
Additional accommodation in the Steam Department.	- For a new store room, offices and model room.	-- Sanctioned 20th July 1842.	Kidderpore - -	40,036 12	45,376 4 6	-- Completed season 1844–45.	-- The saving of *Rs.* 5,339. 0. 8. is ascribed to modifications from the original design.

Construction of Pucca Dry Dock.	-- In lieu of the existing cutcha dock.	-- Sanctioned 19th October 1842, and 5th February 1844.	- - -	92,043 7 9½	87,788 7 1	-- Completed season 1844–1845.	-- In consequence of the difficult nature of the undertaking, the floor of the dock resting on a mass of springs, it became necessary to change the mode of laying the foundation.
Completion of the River Wall, piling and filling up the old Mud Dock and Tank.	- - - - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
Kidderpore:							
Renewing a Store-room, constructing a Coal-tar Tank, &c., in the Naval Storekeeper's Department.	-- At the request of the Superintendent of the Marine.	-- Sanctioned 9th April 1844.	Kidderpore - -	6,507 6 9	6,564 4 1	-- Completed season 1844–45.	—
Construction of Buildings -	-- For the reception of the pump and punching machine.	-- Sanctioned 17th June 1844.	- - - -	8,429 8 9	7,005 3 6	-- Completed season 1845–46.	—
Kidderpore:							
Construction of a Shed -	As a receptacle for coals - -	-- Sanctioned 28th February 1844.	- - - -	477 - -	477 - -	-- Constructed season 1844–45.	—
Dockyard; renewal of a portion of the Retaining Wall.	-- The old retaining wall is in a dangerous state, and the foundations are supposed to be defective.	-- Sanctioned 22d July 1846.	- - - -	-- This work was suspended in 1845–46, as the entrance to a projected wet dock for steamers will be made on part of the intended site; the revetment wall was reconstructed in season 1849–50, at a cost of *Rs.* 11,272. 15. 11.	33,557 1 10	- - - -	-- The section of the new wall will be similar to that of the wharf wall at Sheerness, where the soil somewhat resembles that at Kidderpore.
Kyouk Phyoo: Construction of three Jetties or Piers.	-- For the convenience of the salt traders frequenting the port.	-- Sanctioned 16th September 1844.	Kyouk Phyoo -	- - - - -	3,748 8 -	—	
Kidderpore Dockyard: Construction of a masonry Platform.	-- For setting up an iron crane, shipped by the Court of Directors.	- - - -	- - - -	20,240 - -	17,375 - -	—	
Kootubdea: Lighthouse Buildings.	-- For a lighthouse tower and lantern, with buildings for the establishment of overseers and Lascars, on the island of Kootubdea.	-- Sanctioned 8th October 1845.	Kootubdea Island -	35,289 - 5	29,235 - -	-- Completed February 1846.	-- The excess over the original estimate was occasioned by the rates assumed by the executive engineer being purely conjectural, in consequence of the isolated spot at which the work was to be carried on.
Kidderpore:							
Proposed construction of a Basin or Wet Dock.	For inland steamers - - -	-- Submitted for sanction 19th June 1846.	Kidderpore - -	- - - - -	1,27,211 6 9	- - - -	-- It is proposed to make the entrance into the wet dock through the dry dock, whereby the expense of constructing a new entrance with locks, &c., will be in great part avoided, while the dry dock will still remain available for the purposes of its original construction, whenever required.
Dockyard; construction of Boat and Coal-sheds, and fitting up a Tank.	-- The necessity for these works was brought to notice by the Acting Superintendent of Marine,	-- Sanctioned 21st June 1847.	- Ditto - -	- - - - -	16,057 7 6	—	

(*continued*)

No. 9.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive—*continued*.

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—GENERAL—*continued*.				*Rs. a. p.*	*Rs. a. p.*		
Kidderpore—continued.							
Dockyard; construction of Dwelling-houses.	- - For the Naval Storekeeper and Marine Surveyor and Builder.	- - Sanctioned 29th April 1848.	Kidderpore - -	- - - - -	19,608 11 8	- - - -	- - This arrangement will make the present house occupied by the naval storekeeper available for the assistant surveyor and builder. The quarters of the latter, which are unfit for a dwelling-house, the rooms being confined and low, will be converted into godowns, as proposed by the Marine Superintendent.
Additions and Alterations to the Marine Superintendent's house.	- - Most of the beams and burgahs were in a decayed state.	- - Sanctioned 7th May 1849.	- Ditto - -	7,803 14 -	7,803 14 -	- - Completed season 1849–50.	- - It was at first contemplated, on account of the almost ruinous state of the building, to substitute a new one at an estimated cost of *Rs.* 27,898. 2., but a committee of civil architects were favourable to the retention of the old building.
Kyouk Phyoo:							
New Office for the Salt Superintendent.	- - On a representation from the Board of Customs, Salt and Opium, of the necessity for such an office, in lieu of the old dilapidated building previously used.	- - Sanctioned 24th March 1847.	Kyouk Phyoo - -	11,096 6 10	- - - -	- - Constructed season 1849–50.	—
Erection of a New Treasury, Record Room, and Guard Room.	- - Under a representation from the Commissioner of Arracan, that the existing buildings were unsafe, having been several times actually on fire.	- - Sanctioned 12th December 1849.	- Ditto - -	- - - - -	3,656 - -	Season 1849–50.	—
CIVIL BUILDINGS, LOWER PROVINCES—GENERAL:							
Kurseong: Construction of a Staging Bungalow.	- - This bungalow is to be in the place of the staging bungalow at Mahalderam, built by the Darjeeling committee, but now in a dilapidated state.	- - Sanctioned 5th August 1844.	Kurseong - -	3,190 11 6	3,107 15 4	- - Constructed season 1846–47.	- - At the suggestion of the superintendent of Darjeeling, the site of the bungalow has been removed to Kurseong, which station is five miles nearer the plains than Mahalderam, at which latter place there has hitherto been, and still is, an hotel for the accommodation of travellers.
Kishenagur: Construction of a Post-office at.	- - The accommodation heretofore afforded to the records of the Post-office in the Collector's office, is no longer available.	- - Sanctioned 6th March 1846.	Kishenagur - -	733 9 5	722 - -	- - Completed season 1847–48.	- - This building is to be of pucca, on account of the great destruction of woodwork at the station.

CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—GENERAL:						
Kurnaul: New Roof to the Roman Catholic Chapel.	- - - - - - - -	- - Sanctioned 6th April 1842.	Kurnaul - - -	577 15 11	- - - -	- - Completed season 1842-43.	—
Kussowlee:							
Construction of a Protestant Church at.	- - - - - - - -	- - Sanctioned 17th January 1845.	Kussowlee - - -	- - This work was suspended in season 1845-46.	25,734 12 6	—	
Construction of a Staging Bungalow.	- - The necessity for this bungalow appears to have been brought to notice by the Post-master, North-Western Provinces.	- - Sanctioned 23d November 1844.	- - - -	3,806 12 8	3,913 12 5	- - Completed season 1845-46.	—
Enclosure of the Burying-ground.	- - On a representation from the Archdeacon of Calcutta.	- - Sanctioned 6th November 1848.	- - - -	2,356 6 6	3,555 6 6	- - Completed season 1849-50.	- - The total length of the enclosure wall is 816 feet.
Kurrachee: Erection of a Post-office.	- - Sanctioned by Government in the Foreign Department.	- - Sanctioned 13th July 1844.	- - - -	849 8 —	- - - -	- - Constructed season 1844-45.	—
Kumaon: Alterations to four Staging Bungalows.	- - The necessity for these alterations was brought to notice by the Postmaster-general.	- - Sanctioned 10th November 1848.	- - These bungalows are situated at Penra, Ramgar, Bhumtal and Bamouri.	1,909 9 3	1,909 9 3	- - Completed season 1849-50.	—
CIVIL BUILDINGS, CENTRAL PROVINCES—GENERAL:							
Kheree: Construction of a Staging Bungalow.	- - The existing buildings, owing to the inefficiency of accommodation, did not meet the public wants.	- - Sanctioned 9th September 1843.	Kheree - - -	1,947 1 2	2,037 10 2 and *Rs.* 136. 7. 3. for the requisite furniture.	- - Completed season 1844-45.	—
CIVIL BUILDINGS, SOUTH-WESTERN PROVINCES—MARINE:							
Kidderpore: Construction of a Workshop for the Comptroller of Steam Machinery.	- - - - - - - -	- - Sanctioned 22d May 1839.	- - - -	6,601 12 —	6,893 4 8	- - Completed season 1839-40.	—
ROADS AND BRIDGES, CENTRAL PROVINCES:							
Lucknow Canal: Bridge over the, on the road from the City to Constantia, and Bridging of the Watercourses on that road.	- - These bridges are to be on a new line of road, half a mile less in length than the old road, which is through the King of Oude's private park at Delkoosah; and although his Majesty permits all European gentlemen to use this road, it is apprehended that this privilege would not be extended to all classes of persons proceeding to and from Constantia, after it shall have become a public college.	- - Estimate submitted 26th February 1842.	- - - -	Not reported - - -	12,565 3 6 and *Rs.* 682. 7. 10., for bridges.	Not reported - -	- - The bridge over the Lucknow Canal is to be of three arches; the cost will, it is believed, be defrayed from the Maritime Fund.
ROADS AND BRIDGES, NORTH-WESTERN PROVINCES:							
Loharee Bridge, over the Uril River.	- - Increase of the waterway in consequence of the approaches to it being flooded in the rains.	- - Sanctioned 3d June 1842.	Loharee - - -	11,322 3 5¾	11,333 15 1	- - Completed season 1842-43.	—

(continued)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive—*continued*.

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
ROADS AND BRIDGES, NORTH-WESTERN PROVINCES—*continued*.				*Rs. a. p.*	*Rs. a. p.*		
Lucknow Bridge, and repair of the Causeway.	Two lengths of the causeway, measuring 551 and 307 feet respectively, were entirely destroyed by a violent flood on the 20th June 1842.		Near Seharunpore				The causeway of the Lucknow Bridge is constructed on land arches traversing a plain of deep sand, and extends to a length of 2,224 feet. The bridges and causeway were constructed in the year 1827, at a cost of 36,000 rupees. The piers of the main arches of the bridge are carried down 26 feet below the bed of the river to solid soil. Two of the arches having been choked up, and shown symptoms of settlement in 1847–48, a sum of *Co.'s Rs.* 536. 6. 6. was expended in flooring the spaces between the piers with rough wooden caissons. An estimate, amounting to *Rs.* 1,907, for metalling the roadway of the bridge, was sanctioned on the 1st May 1850; the traffic over the bridge was represented to be incessant.
Landour Roads: Reconstruction of several portions of the Embankment Walls.	These roads were greatly injured by heavy rains in August 1842.	Sanctioned 6th January 1843.		5,548 3 8	5,832 7 11	Completed season 1843–44.	—
Repair of, and Enclosure of parts of the Road leading from the Barracks to the Hospital, with a rough Railing.	These roads were again injured by the heavy rains of August and September 1843.	Sanctioned 1st December 1843.		2,131 5 3	3,444 5 3	Completed season 1844–45.	A railing has been erected along the road.
Lohoo Ghaut: Construction of an Iron Suspension Bridge over the Lohoo River, at.	This bridge is intended to replace an old wooden bridge, which is considered by the local authorities to be no longer safe.	Sanctioned 26th September 1846.	Lohoo Ghaut		2,455 9 7	—	
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—GENERAL:							
Landour: Enclosure of the Burial-ground at.		Sanctioned 1st October 1842.		781 12 9	781 12 9	Completed season 1844–45.	—
Lohoo Ghaut: Construction of a Wall around the Burial-ground.		Sanctioned 21st July 1843.		261 1 2	261 1 2	Completed season 1844–45.	—
Loodiana Church: Addition to	In consequence of the accommodation being insufficient for the increased number of European troops.	Sanctioned 3d April 1844.		4,043 11 2		Completed season 1845–46.	An addition of 40 feet has been made to the length of the church.
CIVIL BUILDINGS, CENTRAL PROVINCES—ECCLESIASTICAL:							
Lucknow Church		Sanctioned in August 1838.		5,400 – – of which, 1,900 rupees were by private subscription.		Completed season 1840-41.	The future repairs of the church will be repaid by the State.

CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—ECCLESIASTICAL:						
Landour Church: Construction of.	- - - - - - - -	Sanctioned in 1838 -	- - - -	6,493 7 6	5,000 - -	- - Completed season 1840–41.	—
Landour Burial-ground: Construction of a Wooden Railing.	To inclose the burial-ground -	- - Sanctioned 29th November 1839.	- - - -	- - - - -	937 11 7	—	
CIVIL BUILDINGS, CENTRAL PROVINCES—POLITICAL:							
Lucknow: Completion and repairs of the Constantia House Buildings.	- - - - - - - -	- - Estimates submitted 13th July 1843.	- - - -	- - - - -	1,96,650 4 4	- - - -	- - The estimates were returned with an opinion that the design appeared good and the rates moderate.
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—POLITICAL:							
Lahore: Conversion of the Anarkuller House into a Residency.	For the Political Resident -	- - Sanctioned 8th October 1847.	Lahore - - -	- - - - -	24,900 - -	- - - -	- - The Resident is to be permitted to occupy the building rent-free, on the condition that he shall keep it in tenantable repair at his own cost, after the additions and repairs provided for have been completed.
CIVIL BUILDINGS, PUNJAUB CIRCLE—GENERAL:							
Lahore:							
Fitting up of a large Hall in Dyan Sing's House.	- - To serve as a place of Divine worship.	- - Sanctioned season 1849–50.	Lahore - - -	1,837 9 2	- - - -	Season 1849–50.	—
Fitting up a Residence in Suchet Sing's House.	- - For the use of the Civil Department.	- - Ditto - -	- Ditto - - -	703 6 2	—		
Erection of a Staging Bungalow, with Offices.	- - On a representation from the Postmaster-general, North-Western Provinces.	- - Sanctioned 29th November 1849.	- Ditto - - -	- - - - -	Not stated - -	Season 1849–50 -	- - The bungalow is to consist of one large room 30 × 18, with two rooms on each side 16 × 14, the whole to be surrounded by a verandah 10 feet high; this will be enclosed on two sides, forming four rooms 10 × 14, with four bathing rooms each 10 × 10.
Construction of a Chapel for the Roman-catholics.	- - - - - - - -	- - Sanctioned 27th October 1849.	- - - -	- - - - -	4,891 9 -	- - - -	- - With reference to the removal of the cantonment from Anarkullee to Mean Meer, this chapel will be constructed at the latter place.
Repairs, &c. of General Ventura's House at.	- - To adapt it for the residence of the Resident and his assistants.	- - Sanctioned October 1847.	- - - -	12,408 7 3	- - - -	Season 1850–51 -	- - The house is situated in the Anarkullee cantonment.
EMBANKMENTS, SOUTH-EASTERN PROVINCES:							
Midnapore Division - -	- - - - - - - -	Length 657 miles -	- - - -	- - - - -	- - - -	- - - -	- - Estimate for annual repairs of 1850–51, including repairs to sluices and inspection bungalows, amounts to *Rs.* 35,411. 2. 1.
Construction of a new line in lieu of the old Zemindary Khattee Bund, in Pergunnah Mingleghaut.	- - For the protection of the Oolabareah mail road.	- - Length, 3 miles 1 furlong; sanctioned 14th February 1842.	- - - -	7,717 5 9	7,717 5	- - Completed season 1843–44.	- - Large plains, heretofore totally unproductive, have been brought under cultivation. Estimate for repairs to the Zemindary embankments for 1850–51, amounts to *Rs.* 12,334. 8. 6.

(*continued*)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
EMBANKMENTS, SOUTH-EASTERN PROVINCES—*continued.*				*Rs. a. p.*	*Rs. a. p.*		
Construction of two Irrigation Channels, with Sluices.	- - These works were proposed by the local authorities for the improvement of the Government estate; viz., the pergunnah of Khider Koond.	- - One of the sluices 16,000 feet in length, the other 765 feet in length, from the Cossye River, with two sluice-gates; sanctioned 8th October 1845.	Midnapore - -	2,078 - -	2,078 - -	Season 1845–46.	—
Construction of two Inspection Bungalows.	- - To enable the executive officer to exercise a vigilant superintendence over the works in progress.	Sanctioned in 1847 -	- - Bheetcool and Itchapore.	593 - 5	593 - 5	- - Completion reported in 1849.	—
Middleton Point, Saugor Island: Construction of a new Bund.	- - In consequence of the old bund having been nearly washed away during the gale of September 1846.	- - Sanctioned 17th February 1847.	- - - -	1,625 - -	1,625 - -	—	
CANALS, SOUTH-EASTERN PROVINCES:							
Mofussil Canals: Improvement of the.	- - By cutting down jungle, repairing and making tow-paths, &c.	- - Sanctioned 28th September 1843.	- - - -	- - - - -	4,368 4 6	- - - -	- - These works will materially facilitate the inland communication.
CANALS, NORTH-WESTERN PROVINCES:							
Muskurra River: Construction of Retaining Dam, south of the Masonry Dam.	- - For the protection of the dam, which, during the flood of the 21st and 22d June 1842, appears to have been in great danger.	- - Sanctioned 2d March 1842.	- - - -	10,490 5 -	13,530 - -	- - Completed season 1843–44.	- - This work has fully answered the expectations entertained of it.
Prolongation of the Boxwork Tail of this Dam.	- - Considered indispensable for the safety of the dam.	- - Sanctioned 29th January 1844.	- - - -	5,398 13 10	6,102 8 5	- - Completed season 1844–45.	—
Muskurra Dam: Repair of damage occasioned by floods.	- - The Muskurra River, by the breaking of the bunds at the Kolawalla Pass, and at the Dawalooka, received all the mountain supply which usually passes off down the Hindun.	- - Sanctioned 20th March 1845.	- - - -	- - - - -	6,222 - -	—	
ROADS AND BRIDGES, SOUTH-EASTERN PROVINCES:							
Midnapore: Construction of a new Masonry Bridge.	- - In lieu of an unserviceable bridge.	- - Sanctioned 28th February 1842.	- - - -	781 8 10	- - - -	- - Constructed season 1843–44.	—
Maggra to Chotekund, on the Grand Trunk Road, metalling of.	- - - - - - -	- - Sanctioned 22d April 1847.	Chotekund - -	- - - - -	76,186 10 5	- - - -	- - The distance to be metalled is about 20 miles. The high rate for metalling (amounting to nearly 4,000 rupees per mile) is occasioned by the great distances at which the quarries are situated.

Maumbhoom: Construction of a Bridge over the Jailgarrah Nuddee.	- - - - - - -	- - Sanctioned 16th October 1843.	Maumbhoom - -	5,929 9 3	8,861 7 1	- - Completed season 1846–47.	- - This bridge is of three arches, of 25 feet span each. The saving of *Rs.* 2,931. 13. 10. was in consequence of a saving on the quantity of masonry in the foundations, and of a great reduction of rates.
Midnapore to Bissenpore: Construction of 12 Masonry Bridges and Drains.	- - To replace the old dilapidated works.	- - Sanctioned 8th September 1847.	Bissenpore - -	1,418 15 7	1,480 - -	- - Completed season 1849–50.	—
Midnapore: Construction of a new Line of Road, and five Masonry Bridges.	- - - - - - -	- - Sanctioned 30th May 1849.	Midnapore Division -	1,743 2 4¾	2,094 - 6	- - Completed season 1849–50.	- - One of the bridges is of two arches, 12 feet span, at Bagdooby Shole; two of one arch, 10 feet span, at Katheepottah Khaul, and Kunkabeetha Shole; and two of one arch, 10 feet span, at Ranga Jhore, and Lodhasoh.
ROADS AND BRIDGES, LOWER PROVINCES:							
Munipore Road - - -	- - To make the communication between the Eastern frontier and the Burmese country comparatively easy.	- - Length, 99 miles and 6 furlongs.	- - Bunksandy, in Cachar, to the village of Munipore.	92,427 9 1	1,26,340 4 4	- - Completed season 1842–43.	- - The line of road was considered by the committee appointed in 1843 to have been judiciously selected, and the construction of it generally to reflect the greatest credit on the engineer officer. The road is quite practicable for the passage of guns, except at one point, where, however, the difficulty may be obviated by the use of ropes.
ROADS AND BRIDGES, CENTRAL PROVINCES:							
Mogul Serai to Allahabad -	- - The project is highly advocated, as forming a direct communication between the Grand Trunk Road, East of Benares and Mirzapore, without crossing the Ganges at Benares, and re-crossing it at Mirzapore, as at present.	- - Length, about 93 miles; estimates submitted 28th February 1840.	Allahabad - -	- - - - -	- - Estimate for the portion of the road from Mogul Serai to Mirzapore, 113½ miles, 1,08,940 rupees.	- - - -	- - In 1840 the Government stated that the large amount contemplated was more than could be assigned to the object from the general resources of the State; it was not intended to abandon the plan altogether, and the surveys and estimates are, therefore, made over to the Commissioner of the Benares Division, with instructions to apply all available resources for the advancement of the project.
Mirzapore to Jubbulpore - -	- - For opening a communication with the Saugor and Nurbudda territories, and with a view to its ultimate continuation to Nagpore and Oomraotee.	Commenced in 1824 -	- - Jubbulpore (this is a portion of the Great Deccan Road).	7,60,302 - -	60,000 - - also, *Rs.* 3,573. 7. 2. for the reconstruction of bridges carried away by hill floods in 1839.	- Completion reported season 1839–40.	—
Metalling the remaining Kutcha portion of the road.	- - - - - - -	- - Length, 18 miles, 6 furlongs, 25 yards.	- - - -	24,944 8 5	- - - -	Completed - -	- - The entire line of this road, measuring 239 miles, is now metalled.
Construction of three Bridges on this Road, between Myhna and Sewngunge.	- - In lieu of bridges carried away by floods in 1839.	- - Sanctioned season 1839–40.	- - - -	3,506 14 -	3,573 7 2½	- - Completed season 1842–43.	—

(continued)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
ROADS AND BRIDGES, NORTH-WESTERN PROVINCES:							
Meerut to Ghazeeoodennuggur: Improvement of the Road.	- - - - - - -	- - Sanctioned season 1848–49; length, 28 miles, 7 furlongs.	Ghazeeoodennuggur -	*Rs. a. p.* For bridges - 7,745 – 5 For metalling 68,861 14 11 For a pucka drain - 7,745 – 5	*Rs. a. p.* 77,407 – – sanctioned for metalling this road.	- - Completed season 1842–43.	- - The construction of this road was first undertaken by the Meerut Road Fund Committee, by whom it was abandoned, after eight miles had been completed, owing to insufficient means; the Committee pledges itself to execute the earthwork, leaving the metalling and bridges to Government. This line of road has been transferred from the Meerut to the 7th division of the Grand Trunk Road; the annual repairs are estimated at 6,825 rupees.
Construction of a Bridge over a Nullah.	For drainage - - - -	- - Sanctioned 27th October 1842.	- - - -	620 4 4	620 4 4	- - Constructed season 1843–44.	—
Meerut to Kurnaul - - -	- - Represented to be useful both for commercial and military purposes.	—					
Mohana: Construction of a Paved Causeway across the River Peorbattee.	- - This work is considered absolutely necessary on account of the roughness of the present crossing, at which vehicles frequently break down, or are so much shaken as to render them almost useless.	- - Sanctioned 16th January 1847.	- - On the road between Gwalior and Seepree.	- - - - -	9,490 3 6	- - - -	- - The causeway is of rough stone, dressed with chisel.
Moozuffernuggur: Restoration of the Bridge over the Kallee Nuddee.	- - Carried away by a flood on the 20th June 1842.	- - Sanctioned 17th November 1843.	At Mulleerah - -	14,404 12 9	11,205 8 2	- - Completed season 1844–45.	- - This bridge was constructed in 1826 by Captain M'Mullin, at a cost of 52,000 rupees. The five principal arches which withstood the flood were founded on wells; those which failed rested only on caissons. To the defect and to the contracted span of the arches, the failure is in a great measure to be ascribed. The piers are to be raised to 14½ instead of nine feet.
Meerut to Khoorja: Construction of a Road.	- - - - - - -	- - Length, 50 miles; sanctioned 24th January 1843.	Koorja - - -	1,48,919 3 8	93,645 3 8	- - Completed season 1846–47.	- - Twenty bridges will be constructed on the line, and four dâk bungalows, viz., Kurkhonda, Hauppera, Gallowtee, and opposite to Boolundshur. The three former bungalows, it was subsequently found, would not be required. The formation and metalling of the portion of this road between Gallowtee and Khoorja (22 miles), which had been left to the Boolundshur Road Fund Committee, was so imperfectly done in the first instance by that committee that a supplementary estimate of *Rs.* 55,274. 10. was sanctioned on the 27th August 1846, for repairing ruts and restoring the metalling.

Mullick Chund Serai, to the boundary of the cantonments at Agra: Construction of a raised Metal Road.	- - - - - - -	- - Length, 1½ miles; sanctioned 20th April 1846.	Agra cantonments -	5,235 4 -	5,235 4 -	- - Completed season 1846–47.	—
Malwa: Construction of a Bridge over the Nullah at Chittrokheree.	- - The Nullah is bounded for irrigation below the road, and after a favourable rainy season there is sometimes a depth of five feet of water on the ford crossed by the road. The Nullah bed being black soil, and the ford impassable for travellers or carts until the season of irrigation has passed over, the necessity for the construction of the bridge is sufficiently obvious.	- - Sanctioned 5th December 1846.	- - - - - - - - - -	2,879 - -	- - - -	- - This bridge is to be of three arches, with raised approaches.
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—JUDICIAL:							
Moulmein: Alterations to the Gaol, and construction of Buildings.	- - - - - - -	- - Sanctioned 9th May 1837.	Moulmein - -	- - - - - -	9,398 6 -	Completed 1841–42.	—
Midnapore: Construction of an additional Room to the Magistrate's Cutcherry.	- - Owing to the small size of the room in which the magistrate's court is held, it has been found necessary to exclude all persons except those whose cases were actually being heard.	- - Sanctioned 18th July 1844.	- - - -	2,348 5 -½	2,349 5 6¼	- - Completed season 1847–48.	- - The existing buildings were inadequate for the proper custody of the numerous valuable papers connected with the survey, resumptions and settlement proceedings, recently brought to a close.
Maumbhom: Construction of a Cutcherry for the Native Judge.	- - - - - - -	- - Sanctioned 20th June 1842.	Maumbhoom - -	1,264 11 -	- - - -	- - Completed season 1844–45.	—
Moulmein Gaol: Alterations to	- - - - - - -	- - Sanctioned 22d June 1844.	- - - -	2,084 2 9	- - - -	- - Completed season 1844–45.	- - The gaol wall, which varied from 9 to 12 feet in height, has been raised to an uniform height of 15 feet all round.
Moulmein Court-house: Alterations to.	- - With a view to improve the interior arrangements.	- - Sanctioned 5th August 1844.	- - - -	1,611 10 2	- - - -	- - Completed season 1844–45.	—
Construction of Night Privies to the Gaol.	- - - - - - -	- - Sanctioned 23d April 1845.	- - - -	426 3 9	426 3 9	- - Constructed season 1845–46.	—
Construction of seven Police Watch-houses.	- - Constructed on the emergent requisition of the Commissioner of the Tenasserim provinces.	- - Sanctioned 23d May 1845.	- - - -	621 - -	621 - -	- - Constructed season 1845–46.	—
Moulmein: Construction of Offices and Sessions Court.	- - For the Commissioner of the Tenasserim Provinces and his principal assistant.	- - Sanctioned 17th October 1845.	Moulmein - -	13,877 3 7	10,569 - -	- - Completed season 1847–48.	- - The excess over the estimate is owing to difference of rates, and the execution of much work which was not provided for.
Mergui: Purchase and Repair of a Building.	For a Circuit-house - - -	- - Sanctioned 2d June 1847.	Mergui - -	1,863 14 9	- - - -	Season 1847–48 -	—

(*continued*)

No. 6.—Statement compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—JUDICIAL—*continued.*				*Rs. a. p.*	*Rs. a. p.*		
Midnapore Gaol: Construction of improved Ventilators, and additional accommodation.	- - Fifty-seven ventilators were constructed in 1841–42, which only partially succeeded, in consequence of their inadequate size, being only 1½ feet square, in improving the salubrity of the gaol.	- - Sanctioned season 1846–47.	Midnapore - -	4,483 1 9	4,010 6 –	- Completion reported season 1849–50.	- - The new ventilatiors are of a larger description, being 8 × 2 in the clear.
Midnapore: Additions to the Collector's and Magistrate's Cutcherries.	- - The construction of seven additional rooms, of pucca masonry, with flat roofs, is required.	- - Sanctioned 16th June 1847.	- - - -	9,612 11 –	9,111 3 –	- - Completed season 1849–50.	—
Mergui Gaol: Construction of a Gaoler's House and Cook-houses.	- - - - - -	- - Sanctioned 3d November 1847.	- - - -	1,647 4 1	1,647 4 1	- - - -	- - The cook-houses were in lieu of others considered to be too near to the compound wall; the house for the gaoler was built in consequence of it being deemed necessary that the gaoler should be lodged within the premises, especially at night.
Moulmein Gaol: Construction of a new Granary.	- - Undertaken on the recommendation of a special committee of survey.	- - Sanctioned 15th February 1849.	Moulmein - -	3,420 4 10	- - - -	Season 1849–50 -	- - The old granary was composed entirely of wood, and covered with thatch, and was reported to be in a very dilapidated and unsafe state.
Moulmein Gaol: Additions to the Gaol Buildings.	- - The Commissioner of the Tenasserim Provinces represented the works to be indispensably necessary with reference to the discreditable and unsafe state of the gaol.	- - Sanctioned 5th February 1851.	Ditto - - -	- - - - -	38,545 14 –	- - - -	- - The required buildings consist of additions to the main ward, a hospital, deputy gaoler's house, solitary cells, dead-house, dissecting room, with out-offices.
CIVIL BUILDINGS, LOWER PROVINCES—JUDICIAL:							
Moorshedabad: Construction of four experimental Penitentiary Wards.	- - - - - -	- - Sanctioned 8th February 1842.	Moorshedabad - -	23,962 – –	23,962 – –	- - - -	These four wards are for 120 men.
Moozufferpore: House of Correction.	- - - - - -	- - Sanctioned 7th December 1841.	Moozufferpore - -	14,947 4 1¾	13,000 – –	- - Completed season 1842–43.	- - The gaol of this place, in consequence of the encroachments of the river, must ere long be entirely given up. The prisoners of this district sentenced to longer periods of confinement than one year, will be sent to the Patna Penitentiary.
Moorshedabad Imambarrah -	- - To replace an old imambarrah in a state of great decay, and which was considered too close to the palace.	- - Sanctioned 7th December 1840.	Moorshedabad -	Not reported - - -	90,000 – –	Not reported - -	- - This work will be paid for from the Nizamut Deposit Fund.
Monghyr Gaol: Construction of additional Wards.	- - For the accommodation of the prisoners, the existing space being insufficient.	- - Sanctioned 17th November 1840.	Monghyr - -	885 6 4½	695 8 9	- - Completed season 1841–42.	—

Monghyr: Construction of a Cutcherry for the Magistrate.	- - Called for with reference to the appointment of a separate officer to the magistracy.	- - Sanctioned 29th July 1844.	Ditto - - -	4,931 - 6	5,190 13 10	- - Completed season 1846-47.	—
Construction of a Circuit House.	- - - - - - -	- - Sanctioned 20th November 1844.	- - - -	4,572 9 3¾	4,999 5 -	Season 1847-48 -	- - A private house was purchased and converted into a circuit house, in accordance with an estimate sanctioned on the 7th October 1845.
Mootecaree: Construction of a Circuit House and Out-offices.	- - - - - - -	- - Sanctioned 20th November 1844.	Mootecaree - -	5,072 10 5	4,999 5 -	- - Completed season 1847-48.	—
Maldah: Purchase of a House, and its adaptation for the purposes of a Circuit House.	- - - - - - -	- - Sanctioned 20th November 1844.	Maldah - - -	5,761 13 11	5,761 13 11	Season 1844-45.	—
Moozufferpore: Purchase of a private Building at.	- - For a cutcherry for the Sessions Judge.	- - Sanctioned 28th December 1838.	- - - -	1,700 - -	- - - -	Season 1841-42 -	- - This building, which was the property of Meer Abdoollah, and had been hired ever since the year 1803 at a monthly rent of 80 rupees, has been purchased for less than two years' rent.
Monghyr: Additions to the Magistrate's and Collector's Cutcherry.	To afford more accommodation -	- - Sanctioned 2d November 1841.	—				
Mymensing: Addition of a pucka tiled verandah to the Judicial Cutcherry.	- - For the accommodation and convenience of suitors.	- - Sanctioned 6th July 1841.	- - - -	883 4 10	- - - -	- - Constructed season 1842-43.	—
Construction of Cutcherries for the Principal Sudder Ameen.	- - The present building is a cutcha building with a thatched roof, and is considered by Government an unfit place (in consequence of its liability to be destroyed by fire) for the reception of documents of great importance, which are now lodged in it.	- - Sanctioned 30th July 1845.	Mymensing - - - - - - -		5,038 - -	—	
Mymensing Gaol: Construction of seven Night Privies.	- - - - - - -	- - Sanctioned season 1844-45.	Ditto - - -	667 13 9½	- - - -	- - Completed season 1845-46.	—
Monghyr: Construction of a suitable Court-house for the Sudder Ameen and Moonsiff.	- - This building is required in lieu of a private building, the property of the former native judge, which is inconveniently situated, being in the heart of the town, and at a considerable distance from other public offices, which are all within the fort.	- - Sanctioned 16th April 1846.	Monghyr - -	908 13 1¾	1,097 - -	- - Completed season 1847-48.	—
Moozufferpore: Raising the pillars of the verandah of the Judge's Cutcherry.	- - To raise the verandah two feet, and to give it a sloping terraced roof.	- - Sanctioned 30th April 1845.	Moozufferpore - -	1,541 13 6	1,541 13 6	- - Completed season 1846-47.	—
Construction of a House of Correction.	- - For 562 prisoners, including patients in hospital at Moozufferpore.	- - Sanctioned 17th November 1847.	- - - -	- - - - -	20,601 9 8	—	

(continued)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839-40, to 1850-51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—JUDICIAL:				*Rs. a. p.*	*Rs. a. p.*		
Muttra Gaol: Improvements to the.	To increase the accommodation -	- - Sanctioned 29th April 1840.	- - - -	3,238 15 9	4,041 - -	- - Completed season 1841-42.	—
Malhout in the Bhuttee Territory: Construction of a well.	- - - - - - -	- - Sanctioned season 1839-40.	- - - -	1,408 6 4	1,000 - -	- - Completed season 1840-41.	- - The excess of 408 rupees was owing to the necessity for making the well 168 feet deep, instead of 90 feet, as contemplated by the estimate.
Meerut: Construction of houses	- - For the non-commissioned officers of the police battalion.	- - Sanctioned 31st March 1845.	- - - -	3,677 - -	3,658 2 10	- - Completed season 1845-46.	—
Mooradabad: Construction of a record room for the Collector and Magistrate's Cutcherry.	- - The Lieutenant-governor satisfied himself, on a visit to the station, of the necessity for this accommodation.	- - Sanctioned 22d August 1845.	Mooradabad - -	5,238 11 4	5,235 - -	- - Completed season 1847-48.	—
CIVIL BUILDINGS, CENTRAL PROVINCES—JUDICIAL:							
Mirzapore:							
Construction of a new Gaol Hospital.	- - On account of the confined and unhealthy site of the existing hospital.	- - Sanctioned 10th August 1841.	- - - -	12,405 6 2	12,698 8 2	- - Completed season 1843-44.	—
Construction of a bridge near Wellesley's Thannah.	- - - - - - -	- - Sanctioned 23d March 1841.	- - - -	610 - 6	- - - -	- - Completed season 1841-42.	- - This work was represented to be very much required.
Construction of a Cutcherry for the Collector and Magistrate.	- - In consequence of the sale of the Custom-house.	- - Sanctioned season 1839-40.	- - - -	15,622 4 5½	- - - -	- - Completed season 1841-42.	—
Mundlaiser Gaol: Additions to	- - - - - - -	- - Sanctioned 27th November 1841.	- - - -	3,771 - 3	2,941 5 -¾	- - Completed season 1842-43.	- - The new building is capable of holding 60 or 70 convicts.
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—REVENUE:							
Midnapore: Additional accommodation to the Collector's Cutcherry.	- - - - - - -	- - Sanctioned 6th April 1841.	- - - -	2,643 8 5	2,762 6 -	- - Completed season 1842-43.	—
CIVIL BUILDINGS, LOWER PROVINCES—REVENUE:							
Moozufferpore: Construction of two dams in the River Little Gunduck.	- - For the protection of the station.	- - Sanctioned 25th April 1842.	- - - -	682 7 11	- - - -	- - Constructed season 1842-43.	- - This work was proposed by the civil officer and the Durbungah Rajah.
Moorshedabad: Record-room for the Collector's Cutcherry.	- - - - - - -	- - Sanctioned 16th June 1840.	- - - -	1,685 2 9¾	- - - -	- - Completed season 1841-42.	—

Mymensing: Construction of tiled Cutcherry for the Deputy Collector and Law Officer, and rooms for records of the Magistrate and Collector.	Rendered necessary in consequence of the crowded state of the collector's cutcherry.	Sanctioned 21st September 1846.	Mymensing	4,948 1 5	35,75 1 2		As very indifferent roofs are made from tiles at the station, a revised estimate was passed, providing for the substitution of flat roof and pucca superstructure walls, in lieu of tiled roofs and kutcha pucca walls.
Moozufferpore: Construction of two pucca Verandahs.		Sanctioned 1st July 1846.	To the east and west sides of the collector's cutcherry.	408 4 3	408 4 3	Constructed season 1847–48.	—
CIVIL BUILDINGS, SOUTH WESTERN PROVINCES—REVENUE:							
Midnapore: Enlargement of the Collector's Cutcherry.	To provide accommodation for the joint magistrate and the assistant.	Sanctioned 13th September 1836.		7,054 10 2			The additions made were four rooms, and verandahs on three sides of the cutcherry.
House for the Revenue Surveyors and Establishment.		Sanctioned 16th January 1838.		2,913 11 4	—		
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—REVENUE:							
Mynpooree: Construction of a Tehsildarry Cutcherry.	For the collector and magistrate	Sanctioned 3d March 1842.	At Ghirole	4,009 11 6	4,174 7 2	Completed season 1843–44.	—
Alterations and additions to the Sirpoorah Cutcherry.	To adapt for the Tehsil establishment of the Lukat Eytah Division.	Sanctioned 7th October 1842.	Sirpoorah	1,728 2 6½		Completed season 1843–44.	—
Mahur: Construction of a Bungalow.	For the deputy collector	Sanctioned 18th June 1846.	Scinde Division	1,964 5 2	1,964 5 2	Completed season 1846–47.	—
CIVIL BUILDINGS, LOWER PROVINCES—GENERAL:							
Moorshedabad College: Construction of.		Sanctioned 6th April 1840.	Moorshedabad	76,500 5 4	73,000 – –	Completed season 1843–44.	In the amount expended is included *Rs.* 2,400. 5. 4., for the purchase of land, &c. for a site, which was not included in the estimate.
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—GENERAL:							
Mohun Chowkee: New Staging Bungalow at.	In the substitution of one previously existing at Rajpore.	Sanctioned 14th November 1840.		1,477 7 3	1,189 13 5	Completed season 1840-41.	It is expected that the convenience of travellers will be much increased by this arrangement.
Mussooree Church: Construction of a new Roof, and repairs of.		Sanctioned 21st September 1841.		1,359 –		Completed season 1843–44.	The cost of furniture is included in the expenditure.
Mozuffernuggur: Construction of Staging Bungalows at Scharunpoor.	The executive engineer was directed to commence upon the buildings without delay, as they were urgently required for the accommodation of travellers.	Sanctioned 18th November 1844.	Scharunpoor	4,122 – –	4,390 3 2	Completed season 1845–46.	—
Meerut: Purchase of a House for a Post-office.	Provided on the representation of the Postmaster-general North-western Provinces.	Sanctioned 25th September 1849.	Meerut	4,500 – –		Season 1849–50	This house was the property of Mr. Charde; the executive engineer considered it well worth the sum asked by the proprietor, and sanctioned by Government for its purchase.

(*continued*)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839-40, to 1850-51 inclusive—*continued*.

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—GENERAL:				*Rs. a. p.*	*Rs. a. p.*		
Midnapore:							
Construction of a Staging Bungalow.	As a resting-place for travellers	- - Sanctioned 14th July 1841.	Midnapore - -	1,442 8 9½	1,463 - 4	- - Completed season 1842-43.	—
Construction of a new School-house.	- - To replace a building which is stated to have been accidentally burnt down.	- - Sanctioned 1st December 1841.	- ditto - - -	3,217 6 7	3,409 - 7	- - Completed season 1843-44.	—
Addition to the Collector's Cutcherry.	For a post-office - - -	- - - - -	- - - - -	- - - - -	1,042 2 1¼	—	
Moulmein: Construction of a new Wharf.	For the principal bazaar - -	- - Sanctioned 17th July 1843.	Moulmein - -	- - - - -	2,672 1 9	- - - -	- - The suspension of the works was ordered on the 23d September 1843, as some changes were stated to be in contemplation, which might render the construction of the wharf unsuitable at the place originally intended.
Middleton Point: Renewal of the Stockade, with saal posts.	- - This stockade must be maintained for the protection of the Government establishment from tigers.	- - Sanctioned 20th November 1844.	Middleton Point -	2,576 2 3	2,665 13 -	- - Completed season 1845-46.	—
Moulmein: Substitution of tiled for thatched Roofs to certain Marine Buildings.	- - For the protection of naval stores.	- - Sanctioned 11th March 1846.	Moulmein - -	719 9 9	736 - 9	- - Completed season 1847-48.	—
Repair of the Roof of St. Matthew's Church.	- - In consequence of the leakage of the old thatch roof.	- - Sanctioned 4th November 1848.	Moulmein - -	1,138 11 11	1,138 11 11	- - Completed season 1849-50.	The new roof is shingled.
CIVIL BUILDINGS, CENTRAL PROVINCES—GENERAL:							
Mirzapore: Construction of a Staging Bungalow.	- - For connecting the line of bungalows on the Deccan road towards Nagpore with those on the Grand Trunk Road from Calcutta to Delhi.	- - Sanctioned 25th September 1843.	Mirzapore - -	2,340 9 2	2,340 9 2	- - Completed season 1844-45.	—
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—MARINE:							
Moulmein:							
Construction of a Hospital Ward within the compound of the European Infantry Hospital.	- - For the reception of sick men of Her Majesty's ships on the river.	- - Sanctioned 24th January 1842.	Moulmein - -	758 8 10	758 8 10	Season 1842-43.	- - The seamen have hitherto been received into the regimental hospital, but owing to the increase in the strength of the corps, the hospital is now barely sufficient for the men of the regiment.
Construction of a Post-office and five Sheds.	For marine stores - - -	- - Sanctioned 27th April 1842.	- - - -	4,004 6 3	3,221 5 7	- - Completed season 1842-43.	—

POLITICAL BUILDINGS, LOWER PROVINCES:						
Moreshedabad: Repairs to the Mausoleum of Mahobat Jung.	- - - - - - -	- - Sanctioned season 1840–41.	At Kooshbang - -	1,914 - -	- - - -	- - Completed season 1842–43.	—
CANALS, NORTH-WESTERN PROVINCES:						
Nyashur Watercourse - -	For irrigation - - - -	- - Sanctiond 21st November 1835.	- - This watercourse leaves the main channel just under the village of Tunda, and passes to the east of Nyashur.	4,030 11 3	- - - -	- - Completed season 1841–42.	—
Nuggeenah Canal:							
At Moradabad - - -	For irrigation - - - -	- - Length, 23 miles; sanctioned in 1839–40	- - - -	33,369 5 7	- - - -	- - Completed season 1841–42.	- - It is expected that 5,000 rupees will be ultimately realised by water rent.
Raising of the banks of the -	- - In order to admit a sufficient quantity of water.	- - Sanctioned 16th March 1841.	- - - -	1,049 11 -	- - - -	Season 1842–43.	—
Nujufghur Jheel Canal: Formation of a Channel for draining the.	- - To enable the people to cultivate such land which in past seasons has been submerged.	Sanctioned 1846–47 -	- - - -	- - - - -	58,077 2 -	- - - -	- - The complete drainage of the Jheel has this year brought a large quantity of land into cultivation.
Nuggeenah Canal:							
Construction of a first-class Chowkee.	- - - - - - - -	- - Sanctioned 3d March 1843.	- - Situated near the regulating dam on the Kuroola Nuddee.	932 7 3	932 7 3	- - Completed season 1843–44.	—
Construction of a second-class Chowkee.	- - - - - - - -	- - Sanctioned 3d March 1842.	- - Situated near Jogeepara.	131 6 3	131 6 3	- - Completed season 1843–44.	—
Nyashur Dam: Increase to the Waterway of the.	- - In consequence of the excessive body of water thrown on the dam during the rains.	- - Sanctioned 31st March 1845.	- - - -	- - - - -	2,040 - -	—	
Nujufghur Jheel Drain: Annual clearance of the.	- - - - - - - -	- - Santioned 3d February 1848.	- - - -	711 14 4	—		
CANALS AND RIVERS, LOWER PROVINCES:							
Nuddea Rivers: Toll Collections.	- - - - - - - -	- - Length of rivers, 420 miles.	- - - -	- - - - -	- - - -	- - - -	- - The toll collections on these rivers, viz., the Blaigerutty, Muttabhaugah, and Jellinghy, during the year 1847–48, amount to *Rs.* 2,38,729. 2. 9. The total expenditure on account of establishment, and for the execution of the works undertaken to facilitate the navigation, amounts to *Rs.* 47,262. 15. 6.; surplus, *Rs.* 1,91,466. 3. 3.
ROADS AND BRIDGES, SOUTH-EASTERN PROVINCES:							
Nuddea: Construction of an Iron Suspension Bridge over the Ishamuttee River.	- - - - - - - -	- - Sanctioned 24th February 1847.	- - At the village of Bungong.	- - - - -	48,000 8 - Of which 20,000 rupees will be subscribed by Baboo Kalleepersaud Podlar.	- - - -	- - The project for this bridge contemplates two spans of 180 feet each, with a roadway 16 feet wide, including the thickness of the half drop bars on each side; the angle of suspension will be 15°.

(*continued*)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive—*continued*.

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
ROADS AND BRIDGES, LOWER PROVINCES:				*Rs. a. p.*	*Rs. a. p.*		
Nowgong District: Construction of Two Roads: viz., from Nowgong to Sumoogooding, *viâ* Deemapore, and from the Golah Ghaut to Deemapore.	In consequence of the contemplated operations against the Aagumi Nagas.	Sanctioned 18th October 1850.	Nowgong District		For the former road *Rs.* 1,030 For the latter road, *Rs.* 1,000		
ROADS AND BRIDGES, CENTRAL PROVINCES:							
Nusseerabad and Ajmere: Improvement of the Road between.	To remove the difficulties attending the passage of wheel carriages between these two places, the one a chief military station, the other a depôt for military stores.	Length 13 ½ miles; estimate sanctioned 13th November 1840.		5,773 14 10	7,979 2 9	Completed season 1842–43.	This road has been made practicable for wheeled carriages.
Further Improvements to	By constructing pucka revetments over watercourses which intersect this line.	Length 13 ½ miles; sanctioned 5th November 1842.		2,259 4 3	2,204 3 10	Completed season 1843–44.	—
ROADS AND BRIDGES, NORTH-WESTERN PROVINCES:							
Newabgunge: Construction of an Iron Suspension Bridge over the Pangyle.	In consideration of the great traffic on the line of road, and of the importance of the bridge to the good of the country.	Sanctioned season 1844–45.	On the road between Bareilly and Perlibheet.	25,943 – –	27,471 11 2 ½	Completed season 1847–48.	—
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—JUDICIAL:							
Noacolly: Construction of a wall around the Gaol Hospital, and one separating the female wards.		Sanctioned 15th January 1833.	Noacolly	1,021 7 11			The works were executed a considerable time back, but there has been delay in the submission of the bill.
Noakallee Gaol: Construction of two additional wards.	For the Hazut and Dewanny prisoners; to effect a better classification of the prisoners.	Sanctioned 4th November 1846.	Noakallee	1,746 – 2	1,964 – –	Completed season 1847–48.	—
CIVIL BUILDINGS, LOWER PROVINCES—JUDICIAL:							
Nowgong: Temporary Buildings, Roads, &c.	The Civil Station of Bungagarah has been removed to Nowgong.			2,948 6 6	—		
Construction of additional Buildings.	As a treasury and record-rooms.	Sanctioned 22d June 1841.		6,417 – –	4,950 8 6	Constructed season 1846–47.	The buildings are to be of pucca materials, with a terraced roof. There has been an excess of *Rs.* 1,466. 2. 6. over the sanctioned amount; and as the executive officer has been able to account satisfactorily for this to the extent of *Rs.* 752. 10. 1. only, he has been held responsible for the balance.

Construction of an additional Gaol Ward and other Works.	- - - - - - -	- - Sanctioned 30th March 1841.	- - - -	906 10 7	- - - -	- Completed season 1841-42.	—
Construction of 20 Drain Bridges.	For drainage purposes - -	- - Sanctioned 12th September 1842.	- - - -	1,722 13 10	1,722 13 10	—	
Construction of a Cutcherry	- - To replace an old cutcherry, built originally of inferior materials, and now in a decayed state.	- - Sanctioned 23d October 1844.	- - - -	7,033 5 11	4,354 9 5	- Completed season 1848-49.	- - The amount includes the cost of an additional wing, not provided for in the estimate, but commenced on, in compliance with a requisition by the Commissioner in Assam.
Construction of a new Circuit Bungalow.	- - In lieu of the present circuit bungalow, which is in an unsafe state.	- Sanctioned December 1845.	Nowgong - -	- - - -	2,752 - -	—	
Erection of a Wall around the Gaol Buildings.	- - In accordance with the views of the civil officers.	- - Sanctioned 28th October 1846.	- - - -	3,302 1 10 ½	3,302 1 10 ½	- - - -	- - - An estimate amounting to *Rs.* 3,188. 10. 2., for the construction of a new gaol in 1848, to consist of a criminal ward 160 × 36, a civil ward 72 × 36, hospital 72 × 36, guard-room and malakana 70 × 20 feet, with six ranges of cooking sheds; the buildings to be thatched over, supported on saul posts and walls of whole bamboo. The new buildings are to be constructed within the walls erected, agreeably to the estimate sanctioned in 1847.
Nattore: New Roofing the south end of the Judge and Magistrate's Cutcherry.	- - - - - - -	- - Sanctioned 20th May 1846.	Nattore - - -	1,732 5 - ½	- - - -	- Completed season 1847-48.	—
CIVIL BUILDINGS, CENTRAL PROVINCES—JUDICIAL:							
Nursingpore: Construction of a Malkana, and additions to the Cutcherry at.	- - - - - - -	- - Sanctioned 1st April 1844.	- - - -	4,094 10 5	4,739 9 -	- Completed season 1846-47.	- - The necessity for these works was brought to notice by the Commissioner of the Saugor Division.
Newabgunge: Addition of a Record-room to the Collector's Cutcherry.	- - - Great inconvenience was experienced from the distance between the cutcherries of the Magistrate and Collector; the new record-room was to be connected by a covered passage.	- - Sanctioned 14th January 1846.	- - - -	7,407 3 2	7,164 - -	- Completed season 1847-48.	—
Neemuck: Construction of a Gaol at.	- - The outlay is chargeable to the revenues of the district of Jawud Neemuck, transferred by Scindia to the British Government.	- - Sanctioned 10th October 1846.	Neemuck - - -	14,109 10 10	17,860 3 8	- Completed season 1848-49.	—
CIVIL BUILDINGS, CENTRAL PROVINCES—REVENUE:							
Naroal: Construction of a new Tehsildarry Cutcherry at.	- - To supersede the old cutcherry at Sorh, which will be sold.	Sanctioned in 1843 -	- - Situated in the Cawnpore District at Soosulampore.	5,687 4 1 ½	5,674 - 7	- Completed season 1844-45.	—

(*continued*

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839-40, to 1850-51 inclusive—*continued*.

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—REVENUE:				*Rs. a. p.*	*Rs. a. p.*		
Noakhally: Construction of a Record-room over the Collector's Cutcherry.	The necessity for this work was brought to notice by Mr. Commissioner Ricketts, who stated that all useless papers among the Bullooah records had been destroyed, and that the remaining papers had been arranged with all practicable economy of space, but that there was no accommodation for them.	Sanctioned 29th December 1847.	Noakhally	3,157 3 1		Completed season 1850-51.	—
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—GENERAL:							
Noakhally: Enlargement of the Burial-ground.		Sanctioned 26th September 1842.	Noakhally	307 14 3	307 14 3	Completed season 1843-44.	The space enclosed measures 92×63.
Nurrungabad; Construction of a Dâk Bungalow at.	In lieu of the existing bungalow, which is in a ruinous state and not worthy of repairing.	Sanctioned 16th September 1846.		3,021 — —	3,021 — —	Season 1846-47.	—
CANALS, SOUTH-EASTERN PROVINCES:							
Oolabareah Canal							The abandonment of this canal was determined on, on the 12th February 1845, owing to its encroachment on the road along its side, and the Khuttee Canal, which is also a communication between the Damoorda and Hooghly Rivers, was repaired and improved.
Ooltadanga:							
Iron Suspension Bridge		Estimates submitted 19th May 1840.		12,658 6 5¾	12,040 2 6	Constructed season 1843-44.	Under instruction from the Court of Directors.
Construction of Roads to the East and West of the Bridge.		Sanctioned 25th July 1844.		1,598 5 7		Completed season 1845-46.	—
ROADS AND BRIDGES, SOUTH-EASTERN PROVINCES:							
Oolabareeah Road:							
Construction of a Bridge on, at Sirrerampore.		Length 51 miles; sanctioned in March 1841.	From the Cossye River to the Hooghly River.	1,619 12 3	2,000 — —	Completed season 1841-42.	Through this road the communication is at present maintained with Bombay *viâ* the Raepore Road.
Renewal of a portion of the	This road, owing to the mistake, in its first formation, of placing the canal to the south or lowest side, instead of the north of the road, is liable to constant injuries during the rains. Owing to this defect, it was found necessary to abandon about 1¾ miles, and a new and more retired line was adopted.	Length 13¼ miles; sanctioned in March 1841.	Ditto	6,504 8 3	6,343 12 3	Completed season 1842-43.	This new line is at a safe distance from the Canal.

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No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Place of Termination, or of Intended Termination.	Length, and Date of Commencement.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—JUDICIAL:				*Rs. a. p.*	*Rs. a. p.*		
Penitentiary: Plan for a Central one.	To contain 2,004 prisoners - -	- - - - -	- - - -	- - - - -	4,41,564 8 5	—	
Pooree: Construction of a Circuit House.	- - For the use of the Commissioner. The temporary building was destroyed by a gale, on the 30th April 1840.	- - Sanctioned 29th September 1840.	Pooree - - -	7,596 8 8½	5,751 8 5	- - Completed season 1842–43.	—
Pooree Gaol: Additional Hospital.	For sick and insane prisoners -	- - The gaol was constructed in the year 1838; the addition of a hospital sanctioned in season 1840–41.	- - - -	1,332 13 7	1,190 11 3	- - Completed season 1841–42.	—
Pooree:							
Reconstruction of the Dispensary.	- - In lieu of a building which was blown down by a gale on the 30th April 1840.	- - Sanctioned 21st February 1843.	Pooree - - -	5,256 15 5	5,437 9 1	- - Completed season 1846–47.	—
Buildings for the use of the Treasury Guard.	- - - - - - -	- - Sanctioned 27th March 1843.	Ditto - - -	2,030 8 4	2,030 8 4	Season 1843–44.	—
CIVIL BUILDINGS, LOWER PROVINCES—JUDICIAL:							
Patna Penitentiary: Construction of four Wards.	- - To supersede the present places of confinement situated in different parts of the station and its vicinity, each at an inconvenient distance from the magistrate's office.	- - Sanctioned 27th October 1845.	Patna - - -	36,251 15 3½	23,677 - -	- - Completed season 1846–47.	- - The plan approved is for the accommodation of 240 prisoners.
Purellia Temporary Gaol, Chota Nagpore.	- - - - - - -	- - Sanctioned 11th October 1836.	- - - -	- - - - -	2,924 7 6	—	
Purneah Gaol: Estimate for flueing the floors.	- - Owing to the dampness in the existing floors.	- - Sanctioned 17th November 1840.	- - - -	1,151 13 1	1,220 10 -½	- - Completed season 1841–42.	—
Purneah Gaol Hospital; Additions to.	- - Additional wards for medicine rooms, &c.	- - Sanctioned 12th October 1841.	Purneah - - -	4,825 7 2	5,098 4 5½	- - Completed season 1845–46.	—
Pubna:							
Construction of a Circuit House.	- - - - - - -	- - Sanctioned 20th November 1844.	Pubnah - - -	4,414 - -	4,999 5 -	- - Completed season 1845–46.	—
Construction of a Guard-room for the Burkundauzes attached to the Judge's Cutcherry.	- - - - - - -	- - Sanctioned 28th December 1846.	Ditto - - -	334 13 3½	- - - -	- - Constructed season 1847–48.	—

Purneah Outer Gaol: Construction of Guard-rooms and Sentry-boxes.	- - For the security of the guards over the convicts.	- - Sanctioned 10th February 1851.	Purneah - - -	- - - - - -	1,270 - -	- - - - -	- - It was considered desirable to allow the convicts a free resort to the inner compound, as at Gyah and Furreedpore; but in order to carry out this plan, it was necessary that the guards should be placed in greater security.
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—GENERAL:							
Pooree:							
Construction of a Wall around the Burial-ground.	- - - - - - -	- - Sanctioned 28th August 1843.	Pooree - - -	945 2 7	1,108 4 -	- - Completed season 1843–44.	- - The necessity for this work was brought to notice by the magistrate of the Southern District of Cuttack.
Reconstruction of the Pucka Treasury and Collector's Cutcherry.	- - These buildings were injured by a storm.	- - Sanctioned 17th April 1843.	Pooree - - -	2,720 5 8½	- - - -	- - Completed season 1844–45.	—
Puchim Bamney Khall: Construction of an Iron Suspension Bridge over the.	- - - - - - -	- - Sanctioned 20th January 1847.	- - On the road from Calcutta to Nullooah and Calpee.	15,800 9 4	15,715 4 5	- - Completed season 1849–50.	- - The span of the suspended roadway is 100 feet between the centres of the standards, with 16 feet width of roadway, or 14 feet clear traffic way. The soil of the khall is good; the piers will therefore be built merely of gratings of saul wood, without piles below them.
CIVIL BUILDINGS, LOWER PROVINCES—GENERAL:							
Purneah: Construction of a Cutcherry.	- - For the sub-deputy opium agent.	- - Sanctioned 18th July 1838.	- - - - -	- - - - -	2,048 12 5¾	- - Completed season 1840–41.	- - The foundation and plinth of the building are of pucka masonry, the superstructure of cutcha pucka, and the roof of tiles.
Patna:							
Donation towards the construction of a new Church.	- - - - - - -	- - Sanctioned 15th December 1840.	- - - - -	- - Government donation of	*Rs.* 16,072 - -	- - - - -	- - For this edifice the Protestant residents at Patna have subscribed 5,500 rupees. It is the intention of the Lord Bishop to make up the deficiency from the Church Building Fund.
Construction of tiled Verandah to the Cutcherry of the sub-deputy opium agent.	- - In lieu of an old verandah, which no longer affords the required protection.	- - Sanctioned 17th March 1843.	Patna - - -	1,113 11 9¾	1,338 10 11	- - Completed season 1844–45.	—
Punkabarree: Construction of a new Staging Bungalow and Out-offices.	- - To replace a similar building constructed by the Darjeeling Committee, which was condemned as totally unserviceable.	- - Sanctioned 18th June 1845.	Punkabarree - -	- - - - - -	3,221 13 1	—	
Patna: New Buildings at the Insane Hospital.	- - For increasing the accommodation.	- - Sanctioned 8th July 1850.	Patna - - -	- - - - -	5,381 14 9	- - -	- - This work was undertaken on the requisition of the magistrate of Patna.
CIVIL BUILDINGS, SOUTH-WESTERN PROVINCES—REVENUE:							
Pooree Pilgrim Hospital: Rebuilt.	- - - - - - -	Sanctioned 1838–39 -	Pooree - - -	1,386 4 2	—		

(*continued*)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839-40, to 1850-51 inclusive—*continued*.

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CIVIL BUILDINGS, SOUTH-WESTERN PROVINCES—REVENUE—*continued*.				*Rs. a. p.*	*Rs. a. p.*		
Patna: Provision of a Circuit Bungalow.	- - The Special Commissioners' cutcherry has been converted for the reception of the office of the Commissioner of Revenue, in order that that officer's cutcherry may be given over for a circuit bungalow.	- - Sanctioned 25th May 1845.	Patna - - -	861 14 8¼	- - - -	- - Completed season 1846-47.	—
CIVIL BUILDINGS, SOUTH-EAST PROVINCES—REVENUE:							
Pooree: Construction of a Treasury Guard-house for the Collector's Cutcherry.	- - - - - - - -	- - Sanctioned season 1839-40.	- - - -	643 7 5½	1,060 8 4	- - Completed season 1841-42.	- - The difference is owing to its having been found practicable to dispense with eight iron gratings, for which provision had been made in the estimate.
EMBANKMENTS, SOUTH EASTERN PROVINCES:							
Ragulpore Bund: Repairs -	- - The bund was breached to a considerable extent in 1848.	—					
CANALS, LOWER PROVINCES:							
Rajmehal Canal: Construction of.	- - For irrigation, and to supersede the changeableness and uncertainty of the channels of the Nuddea Rivers, any permanent improvement of the navigation of which cannot be reckoned on.	- - Length 130 miles; breadth 50 feet, and carrying at the lowest depth five feet water.	- - - -	- - The scheme was rejected by the home authorities in season 1844-45, but a report was called for on another line, viz., from a point near Chinsurah on the Hooghly to one near Monghyr on the Ganges.	38,47,437 - -	- - - -	- - The boats proceeding through the canal would reach Rajmehal on the great river by traversing 202 miles instead of 528 miles, as by the Soonderbund route, saving 326 miles in distance, and from 15 to 20 days in time; an impetus would be given by it to the working of the iron mines and coal fields. The income from it is calculated at 5,80,000 rupees per annum, or 14⅓ per cent. on the gross expenditure, assumed at 40 lacs, to be raised by a toll of two rupees per 100 maunds on all boats.
CANALS, NORTH-WESTERN PROVINCES:							
Rohilcund Canal - - -	Irrigation - - - - -	- - Length 48 miles; estimates submitted in 1840.	- - From a point on the Ramgunga to Shahpore, on the banks of the Dhela, near Moradabad, with a series of branches for irrigation.	- - - - -	4,50,000 - -	- - - -	- - It is probable that 291 square miles will be susceptible of irrigation when the whole of the waters of the Ramgunga are turned into it; the revenue to be derived from it is assumed at *Rs.* 87,531. 4. per annum. The Revenue Board suggested to Government to postpone this scheme until it can be ascertained with greater certainty what advantages it holds out, and whether the undertaking may not interfere with the completion of works of higher importance.
Rajpore Watercourse; Repairs to the.	- - Owing to the unusual height of the floods of the year, some injury had been sustained.	- - Sanctioned season 1846-47.	- - - -	- - - - -	1,88 7 7	—	

ROADS AND BRIDGES, SOUTH-EASTERN PROVINCES:							
Raepore Road: From Calcutta to Bombay.	- - For rendering the overland communication with England easy to travellers, and rapid for the conveyance of the mails.	- - Length from Bombay to Calcutta about 1,200 miles; suggested by the Bombay Government in season 1837-38.	Bombay - - -		From 30,00,000 - - To 50,00,000 - - (30 to 50 lacs.)	- - - -	- - In 1838-39 the Court were advised of measures adopted for improving the communication between Calcutta and Bombay, but the information supplied was too incomplete to enable them to decide on the line of transit, or the nature of the road which should be constructed. The Resident at Nagpore reported the willingness of the Rajah to contribute 20,000 rupees towards the road, which he was authorised to accept with suitable acknowledgments. Two plans were submitted; first for the construction of a road to be at all times practicable for wheel carriages, for travellers, and for transit of trade between Bombay and Calcutta; second, to facilitate the conveyance of mails between the capitals, by rendering the line of communication practicable for horsemen or foot-runners. Of the 1,200 miles, 232 had been made practicable for horsemen or dawk runners, by means of a grant of 20,360 rupees, which had been already authorised, and 968 miles remained. As the plans involved a very large outlay, the Court were desirous that no portion of that which remained should be commenced until a more satisfactory survey of the line was made, and an estimate of the expense submitted to them; but as the main road on to Bombay could not be completed for some years, the Government were authorised to take immediate measures for forming a road for horsemen and dawk runners from Ahmednuggur to Midnapore, which would be practicable throughout the year. The Court subsequently (under date the 3d January 1845) informed the Government that they could not sanction the construction of an expensive road, and directed that their exertions be confined to the discovery of the best route, on which such improvements only should be made as the transit of the mails imperatively required.
Construction of four large Bridges on the Third Division of this Road.	- - - - - - -	Of 3 arches, 30 feet span each.	At Sakelie River - - - - - -		10,074 7 4	*Rs. a. p.* 48,623 2 8	—
		Of 3 arches, 36 feet span each.	At Sandrawapat - - - - - -		9,957 4 6		
		Of 5 arches, 45 feet span each.	At Choolbund - - - - - -		19,888 13 2		
		Of 2 arches, 45½ feet span each; sanctioned 15th January 1845.	At Cheekala - - - - - -		7,942 10 8		
Cutting and rooting out Jungle between Sacra and Soharapallee.	Clearing the road - - -	- - Length 43½ miles; sanctioned 3d April 1850.	Soharapallee - - - - - -		7,159 - -	—	
Ruttenpooral Nullah, on the Grand Trunk Road: Construction of a masonry Bridge over the.	- - - - - - -	- - Length 222 feet; sanctioned 2d October 1843.	- - - -	11,325 11 3	11,325 11 3	- - Completed season 1846-47.	- - This bridge is stated to be a handsome and durable structure, leading the road over two very awkward nullahs, and bringing it up to a horizontal level with the heights east and west.
ROADS AND BRIDGES, LOWER PROVINCES:							
Rewhar Ghat to Mozufferpore in Tirhoot.	- - - - - - -	- - Length 23 miles 7 furlongs; sanctioned 22d November 1836.	Mozufferpore - -	63,291 - -	- - - -	- - Completed season 1839-40.	—
ROADS AND BRIDGES, NORTH-WESTERN PROVINCES:							
Rajpore Dhoodlee: Widening of the Road.	- - - - - - -	- - Length 14 miles; sanctioned 12th January 1842.	Dhoodlee - -	1,485 11 1	- - - -	- - Completed season 1843-44.	—

(*continued*)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive – *continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—JUDICIAL:				*Rs. a. p.*	*Rs. a. p.*		
Ramree: Construction of a New Gaol.	To replace the old gaol, which was represented to be in a dangerous state of decay.	Sanctioned 14th August 1843.	Ramree	7,056 8 5	6,739 10 6	Completed season 1844–45.	The new goal will be surrounded by a pucka wall 18 feet high, and will consist of one dewanny ward and three foujdaree wards, a hospital, guard-room, &c. The walls of these buildings will be composed of planks, and the roof of thatch.
Ramree: New Circuit Bungalow.		Length 80 feet; breadth 64 feet; sanctioned 1st August 1839.	Ramree	5,964 16 9	6,071 6 8	Completed season 1841–42.	—
CIVIL BUILDINGS, LOWER PROVINCES—JUDICIAL:							
Rungpore Gaol: Additions to	To improve the salubrity of the gaol.	Sanctioned season 1841–42.		819 6 2	819 6 2	Completed season 1841–42.	Much sickness had existed at this gaol.
Rungpore: Conversion of an old Judicial Cutcherry into a Gaol Hospital.		Sanctioned 28th December 1842.		3,493 6 9	11,228 5 5	Season 1849–50	The estimate provides for new roofing part of the building, removing partition walls, and dividing the hospital for the separate accommodation of male and female patients; it also provides a place for the native doctor, and medicines, and for a guard-house, cook-room, and well.
Construction of a Circuit House, Sudder Ameens' Cutcherry, &c.	To provide accommodation for the Judges' records, and the property of persons dying intestate at Rungpore.	Sanctioned 3d April 1843.	Rungpore	7,728 – –	6,791 2 3	Completed season 1845–46.	Owing to the porous nature of the tiles made at Dacca, and the consequent leakiness of the roof, it has been found necessary to replace the tiled roof with a flat roof; the excess of *Rs.* 1,403. 5. 3. has been disallowed by Government.
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—JUDICIAL:							
Rhotuck: New Gaol		Sanctioned 7th December 1839.		7,790 15 7¼	6,742 2 8	Completed season 1839–40.	This gaol is capable of accommodating 350 prisoners; the walls are of cutcha pucka materials, and the roof is of thatch.
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—GENERAL:							
Roorkhee: Construction of Buildings.	For a civil engineering college	Sanctioned December 1847.	Roorkhee		19,000 – –	—	
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—GENERAL:							
Russapuglah: Additions and alterations to the Building occupied as the Office of the Superintendent of the Mysore Princes.	To convert it into a school-room.	Sanctioned 15th February 1843.	Russapuglah	It was decided by Government, on the 5th July 1848, not to sanction the proposed outlay on this account.	8,851 6 1		The Board solicited the orders of Government to be allowed to call for tenders for the execution of the work by contract.

CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—REVENUE:							
Rancea in the Bhuttee Territory: Construction of a Tehsildary Cutcherry.	- - - - - - -	- - Sanctioned 7th November 1840.	- - - -	6,014 14 –	5,653 15 1	- Completed season 1842–43.	—
EMBANKMENTS, LOWER PROVINCES:							
Sarun and Tirhoot Bunds: Construction of a new Bund, about 1,000 yards from the old Bunds.	- - For the protection of the country between the villages of Nowkurrah and Pursadee from encroachments of the Gunduck River.	- Length 23 ¼ miles; sanctioned October 1841.	- - - -	4,877 4 5	5,031 4 9	- - Completed season 1842–43.	- - The length of these bunds is 140 miles, and the estimate for their annual repair, *Rs.* 26,205. 11. 2.; the executive officer has been directed to adopt the standard section, making the bunds three feet above the highest known rise of the river, three feet wide at the top, and giving a slope of three to one towards the river, and two to one in the rear.
Construction of some new inner Bunds at Sarun, and strengthening of part of the main Bund.	- - Owing to encroachments of the River Gunduck.	- Length four miles; sanctioned 4th April 1845.	- - - -	6,512 7 –	9,151 4 2 ¾	- - Completed season 1848–49.	—
Construction of new Bunds -	- - In parts where the main bund is encroached on by the River Gunduck.	- - Sanctioned 29th April 1846.	- - - -	2,781 9 2	3,351 – –	- - Completed season 1848–49.	—
CANALS, NORTH-WESTERN PROVINCES:							
Seharunpore: Construction of a Corn-mill House.	- To replace the former building, set of mills which were destroyed by the failure of the foundations in December 1844.	—					
ROADS AND BRIDGES, SOUTH-EASTERN PROVINCES:							
Sandoway: Reconstruction of the Thoo's Bridge at - -	- - To keep open the communication between his cutcherry and the most populous part of the Sandoway Valley below the village.	- - Sanctioned 30th October 1844.	Sandoway - -	643 9 –	1,111 11 –	- - Completed season 1845–46.	- A saving of *Rs.* 468. 2. 6. was effected by a reduction in the rate for carpenters' work.
Sowrah Bridge: Repairs to -	- This bridge crosses the Sowrah River.	- - Length of the bridge 300 feet, width 20 feet; repairs sanctioned seasons 1845–46 and 1848–49.	- - Crosses the public road between the station and town of Purneah.	1,594 8 –	- - - -	- - Completed season 1845–46.	- - This bridge was built in the year 1822, and the woodwork had become decayed, and required to be replaced.
Shaikpore: Construction of two Bridges on the Grand Trunk Road.	- - - - - - -	- - Sanctioned 1st July 1846.	- Between Burdwan and Gyretty. - - - - -	18,458 15 8	- - - -		- - One bridge of three openings of 36 ¼ feet each, and arches to be segments of a circle, rising 14 feet; the other of three openings 20 feet each, with similar arches, five feet in height.
Satgong to Muggra, on the Grand Trunk Road: Widening of the Road.	- - The metalled portion has been widened and the road straightened.	- - Length two miles and 100 yards; sanctioned 24th March 1847.	Muggra - - -	7,113 10 –	7,490 11 1	- - Completed season 1847–48.	- - Both khod and gooting have been used in the repairs and extension of the metal.

(*continued*)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839-40, to 1850-51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
ROADS AND BRIDGES, LOWER PROVINCES:				*Rs. a. p.*	*Rs. a. p.*		
Seebsaugor to Jypore in Upper Assam.	- - - - - - -	Length 56 ½ miles -	—				
Seebsaugor to Borahaut, in Upper Assam; Repair of an Old Road.	- - - - - - -	Length 50 miles.	Borahaut - -	- - - - -	3,765 - -	- - - -	- - This work has been executed by the political officers of Government.
Seebsaugor to Debroghur -	- - - - - - -	Length 17 ¾ miles.	—				
Seebsaugor to Chokey Haut, on the Booree Dehing River.	- - - - - - -	- - Sanctioned 21st June 1841.	Chokey Haut.	—			
Saikwuh to Runyagorah in Assam: Opening of part of the Road.	- - - - - - -	- - Sanctioned 14th December 1844.	Runyagorah - -	2,145 13 -	2,145 13 -	Season 1844-45.	—
ROADS AND BRIDGES, CENTRAL PROVINCES:							
Saugor to Dumoh: Change in the line of Road.	- - To obtain a line more accessible to the traffic of the country, to which the imperfectly finished ghauts on the old line presented obstacles.	- - Sanctioned 22d October 1840.	- - - -	1,031 4 2 ½	1,199 9 10	- - Completed season 1842-43.	- - The ascents over the ghauts on the old line were as steep as 1 in 10 or 1 in 12.
Saugor: Erection of an Iron Suspension Bridge over the Beose River.	- - - - - - -	- - - -	- 10 miles east from Saugor.	38,177 6 -	- - - -	Constructed in 1832	- - This bridge was constructed in 1832 by Major Presgrave. The span is 200 feet; breadth of platform 12 feet; height of pillars and piers 68 feet. Repairs were effected in season 1846-47, at a cost of *Rs.* 3,448. 5. 9.
Bridge over the Surjoo River at Lot Ghaut, in the District of Azimghur.	- - For the promotion of the traffic between the districts of Goruckpore and Azimghur.	- - Sanctioned 24th January 1848.	Lot Ghaut - -	8,752 5 11	- - - -	- - Completed season 1841-42.	- - This bridge is of masonry and of three arches; the centre arch 34 feet span, and the side ones 28 feet each.
ROADS AND BRIDGES, NORTH-WESTERN PROVINCES:							
Sehagur River: Bridge over the	- - To keep open the communication between Futtyghur and Etawah.	- - Sanctioned 25th July 1840.	Sehagur River -	2,513 - -	2,513 - -	Season 1840-41.	—
Scharunpore: Bridge over the Dholla Khallat.	- - In lieu of a bridge of two arches, which was destroyed by a high flood on the 27th September 1841.	- Sanctioned season 1841-42.	Shrunpore - -	2,753 4 9	2,753 4 9	Season 1841-42.	—
Singapore Bridge - - -	- - - - - - -	- Sanctioned season 1838-39.	- Over the Singapore River.	19,511 5 2	- - - -	- - Completed season 1841-42.	- - This bridge was constructed under contract, and it is reported to be of a permanent and sustantial order.

Scharunpore: Repairs to the Dumolah Bridge.	-- Injured by the floods of 20th June 1842.	-- Sanctioned 17th November 1843.	- - - -	1,582 3 9	1,645 14 9	-- Completed season 1843-44.	—
Sukkur and Shikarpore: Construction of a Road.	-- To be passable throughout the year for troops and wheel carriages.	-- Length 24 miles; width 40 feet; sanctioned 21st February 1845.	Shikarpore - - - - - - - -		52,008 2 8	—	
Sombre River: Works on the	-- For the protection of the right bank of the river.	-- Sanctioned 5th July 1848.	- - - -	3,459 8 10	4,561 3 4	-- Completed season 1849-50.	-- The works consisted in diverting the river from its tortuous course by directing the stream into the cut formerly excavated by Major Baker, and in grooving a new splay mouth to the old channel, and throwing out a spur at its head, formed of clay rivetted in front with cribs, also loaded with clay.
Subathoo to Hurripore Road: Construction of a Revetment Wall.	-- To prevent land slips near the Koujar Nuddie.	-- Sanctioned 28th December 1849.	At the Konjer Nuddie - - - - -		4,949 3 11	Season 1849-50.	—
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—JUDICIAL:							
Soory: Construction of a Cutcherry for the Native Judge.	-- The accommodation afforded in the magistrate's cutcherry being quite unfit for holding his court.	-- Sanctioned 20th June 1842.	- - - -	959 - 11	1,176 7 7	-- Completed season 1843-44.	—
Sandoway: Construction of a Treasury Record-room and Guard-room of masonry.	-- In lieu of others of a like nature, which were condemned in the annual survey report of the 26th November 1841.	-- Sanctioned 19th June 1843.	Sandoway - -	2,600 6 2	2,243 6 5	-- Completed season 1845-46.	—
Sulkea: Construction of a Thannah of Pucca Materials.	-- Intended to replace the existing thatch and bamboo houses, which being situated in the heart of Sulkea, are liable to be burnt down.	-- Sanctioned 11th March 1846.	Sulkea - - -	1,126 12 10	1,055 - -	-- Completed season 1847-48.	—
Soory Gaol: Construction of a new Hospital.	-- In consequence of the crowded state of the gaol, the ward heretofore used as a hospital has been assigned for the use of the prisoners, and the sick removed into a thatched building in the civil gaol.	-- Sanctioned 17th June 1846.	Soory - - -	4,248 1 10	4,334 2 8	-- Completed season 1849-50.	-- The enlargement of the area of the gaol, by building a new surrounding wall on the north side, and the elevation of the outer surrounding wall to the uniform height of 15 feet, is intended.
CIVIL BUILDINGS, LOWER PROVINCES—JUDICIAL:							
Sandoway: New Thana House in Arracan - - - - - -		-- Measurement 60 feet by 30; sanctioned 14th April 1840.	- - - -	810 3 10	844 13 2	-- Completed season 1841-42.	-- The wall will be of mat, the roof thatched, but the floor will be well raised and planked.
New Circuit House - -	For the use of the Commissioner	-- Sanctioned season 1838-39.	Sandoway - -	2,347 9 6	2,406 9 -	-- Completed season 1842-43.	—

(continued)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CIVIL BUILDINGS, LOWER PROVINCES—JUDICIAL—*continued.*							
				Rs. a. p.	*Rs. a. p.*		
Seibpore, in Assam		Cutcherry, 100 by 40 feet; with wings, 30 by 40 feet; a treasury guard, 52 by 33 feet; a criminal gaol, 100 by 38 feet; a dewanny gaol, 100 by 38 feet; a thanah house, 35 by 22 feet; sanctioned 20th February 1839.			2,535 2 10	—	
Shahabad: Purchase of a School-house.	For a cutcherry for the magistrate.	Sanctioned 4th February 1841.		8,000		Season 1842	This building had been newly constructed.
Improvement of the Drainage of the Gaol.		Sanctioned 26th January 1842.		1,195 12 6½	1,246 6 6	Completed season 1842-43.	—
Seebsaugor, in Upper Assam: Construction of a Cutcherry.	For the magistrate, in lieu of a cutcherry which was destroyed by fire on the 25th August 1840.	Sanctioned 26th January 1841.		1,516 15 10¾	1,329 9 —	Completed season 1842–43.	The building consists of a room 80×20 feet, with a wing 30×20, and a 10 feet verandah all round.
Seebsaugor: Construction of a new Gaol Hospital, with a new Bamboo Stockade to the Gaol.		Sanctioned 18th February 1840.		887 13 3		Constructed season 1842–43.	The building consists of one centre room 84×20, with an eight feet verandah all round.
Seebsaugor, Lower Assam: Construction of a Gaol at.	For 204 prisoners, males and females.	Sanctioned 3d April 1843.	Seebsaugor	This work was suspended in season 1843–44.	9,008 14 4		The foundation and plinth of the gaol wards will be of masonry, and the remainder of the building will be composed of temporary materials.
Silchar: Construction of a new Mohafez Thanna and Treasurer's Room.	For the security of the records and treasure.	Sanctioned 6th November 1844.	Silchar	2,072 1 7	2,239 4 7	Completed season 1846–47.	—
Seebsaugor:							
Construction of a new Treasury and Thannah.	In lieu of similar buildings blown down in a storm in May 1843.	Sanctioned 21st August 1843.	Seebsaugor	618 3 1	—		
Provision of a new Gaol	The permanent hospital constructed for the light infantry is to be converted into a gaol.	Sanctioned 3d April 1843.	Seebsaugor	17,884 10 4	17,308 2 1	Completed season 1845–46.	—
Sylhet; Improvements to the Gaol Hospital.	This hospital, which was originally a mosque, is considered by the medical officer, from its extreme lowness, an unfit habitation for the sick.	Sanctioned 15th March 1847.	Sylhet	1,821 1 4	1,885 — —	Completed season 1849–50.	The estimate provides for raising the roof 6½ feet higher; and with a view to improve the ventilation, the surrounding wall, with the guard-room, will be removed to a proper distance.

Seebsaugor:							
Rebuilding of the Circuit House.	- - This work was necessary, in consequence of the damage sustained by the old circuit-house during a storm on the 28th April 1846, when the walls were so forced out of the perpendicular as to make the building in imminent danger of falling.	- - Sanctioned season 1847–48.	Seebsaugor - -	- - - - - -	- - - -	- - Completed season 1847–48.	—
Renewal of the Gaol Stockade	- - The necessity for this work was reported by the civil authorities.	- - Sanctioned 8th December 1847.	Seebsaugor - -	485 4 1	483 8 9	- - Completed season 1848–49.	—
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—JUDICIAL:							
Shajehanpore: Construction of a new Pucca Gaol Hospital and Buildings.	- - In lieu of inferior buildings built by the civil officer.	- - Sanctioned 15th September 1843.	Shajehanpore - -	5,276 8 7	5,207 13 3½	- - Completed season 1845–46.	—
Sirsa: Construction of a Well at	- - For the use of the Judicial Department.	- - Depth 113 feet, diameter 8 feet; sanctioned 26th March 1841.	Sirsa - - -	1,193 10 10	1,193 10 10	Season 1841–42.	—
Seharunpore: Construction of a Pucka Guard-room at the Gaol.	- - Owing to the insufficiency of the existing guard-rooms.	- Sanctioned 8th December 1843.	Seharunpore - -	930 1 10	930 1 10	Season 1843–44 -	- - The new building is to accommodate 30 men.
Shikarpore: Conversion of the Fort into a Gaol.	- - - - - - -	- Sanctioned 3d April 1845.	Shikarpore - -	4,531 8 2	4,531 8 2	Season 1845–46.	—
Shikarpore Gaol: Construction of a Hospital, Cook-room, &c., to the.	- - - - - - -	- - Sanctioned 24th January 1846.	Shikarpore - -	1,521 - -	1,521 - -	—	
CIVIL BUILDINGS, CENTRAL PROVINCES—JUDICIAL:							
Saugor Gaol; Enlargement of the.	- - In consequence of the removal of 100 prisoners from the district of Dumoh.	- - Sanctioned 16th April 1845.	- - - -	47,386 - -	45,528 9 8	- - Completed season 1847–48.	- - Government was of opinion that occasions might arise in which this gaol might aid the military defence of the place, and expressed a desire that the building should be calculated for defence by a small body of men; and that provision should be made within the gaol for the occasional close confinement of all the prisoners. The new gaol has been fortified, and is on a much more extensive scale than the Dumoh gaol.
Seeonee Gaol: Additions and Alterations.	- - Under a representation from the Sessions Judge of the want of accommodation for the ordinary number of prisoners of the district.	- - Sanctioned 30th August 1849.	Seeonee - - -	9,134 4 2	- - - -	- - Completed season 1850–51.	- - The gaol accommodation had become quite inadequate, as Government refused to allow the surplus prisoners to be employed in out-gangs.

(continued)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive—*continued*.

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Competition.	Probable Time of Completion.	REMARKS.
CIVIL BUILDINGS, EASTERN SETTLEMENTS—JUDICIAL:				*Rs. a. p.*	*Rs. a. p.*		
Singapore:							
New Police-office	- - - - - - - -	- - Sanctioned 13th November 1839.	Singapore - -	4,041 9 7	- - - -	Constructed 1840–41.	—
Construction of a Police Thannah at Campong Clang.	- - - - - - - -	- - Sanctioned 25th March 1840.	Singapore - -	3,143 7 6	- - - -	Constructed 1840–41.	—
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—GENERAL:							
Saugor Island: Construction of a Lighthouse on Middleton Point.	- - With a view of replacing the present tripod, which the Superintendent of Marine, after a personal inspection, reported to be in a ricketty condition, and accordingly recommended a masonry tower in preference to the reconstruction of a tripod, on the score of ultimate economy, as well as superior efficiency.	- - Sanctioned 18th January 1847.	Middleton Point -	- - - - -	25,938 9 4	- - - -	- - The new lighthouse will be a taper column, divided into five vaulted storys, and surmounted by a lantern of copper and plate glass. Total height of the beacon terrace 102 feet; the shaft 82 feet in height, tapering from 20 feet at bottom to 12 feet diameter at top, and surmounted with stone coping and battlement. In season 1847–48 the Military Board reported that the encroachment was so great, that it was feared that the masonry lighthouse must be abandoned, and an iron lighthouse substituted, the rough estimate for which, amounting to 44,130 rupees, had been referred to the Home Authorities. Court, on referring to parties experienced in the construction of iron lighthouses, for their opinions as to the relative merits of Colonel Irvine's, Major Godwyn's, or some other plan, were satisfied that preference was due, on several accounts, to the shell or iron plate mode of construction; they accordingly accepted an offer made by Messrs. Fox, Henderson and Co., to furnish an iron plate lighthouse, with iron staircase, gun metal lantern, glazed with plate glass, and covered with copper, reciprocating light, with silvered parabolic reflectors, together with certain stores and lighting materials, for the sum of 2,164 *l.*, or about 400 *l.* less than the estimated cost of a structure of masonry.

CIVIL BUILDINGS, CENTRAL PROVINCES—GENERAL:							
Sulkea: Construction of New Salt Golahs.	- - - - - - -	- - Orders of Government, 5th July 1837.	Sulkea - - -	50,901 5 10	57,244 8 4	- - Completed season 1838-39.	- - These golahs, 11 in number, are of pucca masonry, and have been well constructed by Captain Fitzgerald at a cost of *Rs.* 6,343. 2. 6. less than the sanctioned estimate.
Construction of Division Walls in 27 Salt Golahs.	- - In consequence of the loss resulting from the present plan of separating salt of different qualities by mats, in these golahs, as the mats frequently rot, and the salt becomes mixed.	- Sanctioned 19th August 1840.	Sulkea - - -	7,879 4 3	8,606 9 - ¾	- - Completed season 1841-42.	—
Renewal of the roofs and Improvements to some of the Salt Golahs.	- - In consequence of the great wastage of salt occasioned by leakage.	- Sanctioned 23d December 1840.	- - - - -	- - - - - -	16,470 3 -	—	
Secundrabad: Erection of a Staging Bungalow and Out-offices.	- - - - - - -	- Sanctioned 19th August 1843.	- - Situated on the Grand Trunk Road between Allyghur and Delhi.	2,072 13 5	2,133 4 4	- - Completed season 1843-44.	—
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—GENERAL:							
Shekoabad: Erection of a Staging Bungalow.	- - For the accommodation of travellers proceeding to or from Agra.	- Sanctioned 5th September 1840.	40 miles from Agra -	794 10 6 and 80 13 7 for furniture.	844 13 9	- - Completed season 1841-42.	—
Syree, in the Hill District of Subathoo: Construction of a Staging Bungalow.	- - To replace an old bungalow, which did not afford sufficient accommodation to travellers.	Sanctioned 1839-40	- - - -	- - - - -	1,282 6 9	—	
Simlah: Construction of Public Offices.	- - For the civil officers of the station.	- - Sanctioned season 1840-41.	Simlah - - -	6,053 4 4	4,643 14 -	- - Completed season 1842-43.	- - The excess was owing chiefly to the erection of out-offices, which were not included in the estimate.
Subathoo: Construction of a Protestant Church.	- - This building is to be calculated to hold 500 persons.	- Sanctioned 7th February 1845.	Subathoo - -	- - This work was suspended; *vide* paragraphs 322 and 323 of Report of 1845-46.	16,798 7 6	- - - -	- - The masonry throughout to be of dressed stone, with lime cement, but without plaster, and the roof to be formed of shingles on battens, rafters, purlins, and trusses.
Proposed construction of a House.	- - To serve for the performance of Divine Service on the Sabbath, and for a school-room on other days.	- - - -	- - - -	- - - - -	5,491 15 6	—	

(*continued*)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
				Rs. a. p.	*Rs. a. p.*		
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—GENERAL—*continued.*							
Syree: Construction of additional rooms to the Staging Bungalow.	-- The necessity for additional accommodation was brought to the notice of Government by the Postmaster-general.	- Sanctioned 23d August 1850.	Syree - - -	- - - - -	1,276 12 4	—	
CIVIL BUILDINGS, CENTRAL PROVINCES—REVENUE:							
Seeonee: Construction of a Tuhsildarry Cutcherry.	- - - - - -	-- Sanctioned season 1839–40.	- - - -	986 14 8	1,304 13 9	-- Completed season 1841–42.	—
Sumeerpore: Construction of a Bungalow and Out-offices at the Cotton Farm.	- - - - - -	Sanctioned July 1842	- - - -	- - - - -	9,944 10 7	- - - -	-- The execution of this work was subsequently entrusted to the Civil Department, not however before an outlay of *Rs.* 1,587. 12. –. had been incurred by the executive engineer in the collection of materials.
Secundra, in Zillah Cawnpore: Construction of a Tuhsildarry Cutcherry at.	-- In consequence of the lapse of the Secundra Jagheer, and the annexation of the Pergunnah to the Cawnpore District.	- Sanctioned 4th November 1842.	Secundra - -	5,491 2 –½	5,139 13 8	-- Completed season 1844–45.	--
Sheorajpore: Construction of a Tuhsildarry Cutcherry at.	-- To replace the present cutcherry, which is represented to be very confined and insecure, being surrounded by and connected with the houses of the village.	- Sanctioned 9th May 1844.	-- Sheorajpore, in the Cawnpore District.	5,624 2 1	5,679 15 –	-- Completed season 1846–47.	--
CIVIL BUILDINGS, CENTRAL PROVINCES—ECCLESIASTICAL:							
Saugor Church - - -	-- For the benefit of the Christian community and the European soldiery.	-- Sanctioned 30th December 1835.	Saugor - - -	10,272 14 5	- - - -	-- Completed season 1840–41.	-- This church was surrounded by a wall in 1842–43; the cost, *Rs.* 1,568. 14. 10., was paid by subscription.
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—REVENUE:							
Soneput, in the Northern Division of the Delhi District: Construction of a Cutcherry.	- To replace a cutcherry built by the late Baba Bhae, which was in a state of disrepair, and in an objectionable situation.	-- Sanctioned 18th December 1838.	- - - -	6,405 1 4	—		

Shahjehanpore: Additions and alterations to the Collector's Cutcherry.	-- Rendered necessary by the union of the offices of Collector and Magistrate of the district.	-- Sanctioned 16th September 1845.	Shahjehanpore - -	7,364 11 6	7,700 - -	-- Completed season 1844-45.	-- The old cutcherry was disposed of, for a sum of 3,100 rupees, to Captain Ludlow.
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—POLITICAL:							
Shikarpore: Repairs to the Old Agency Buildings.	- - - - - - -	- Sanctioned 22d July 1844.	Shikarpore - -	7,000 - -	7,000 - -	Season 1844-45.	—
Scinde: Construction of an Office.	-- For the Secretary to the Government of Scinde.	- Sanctioned 9th November 1844.	Scinde - - -	- - - - -	2,169 4 3	- - - -	-- The walls will be of brick and mud, and the roof tiled.
EMBANKMENTS, SOUTH-EASTERN PROVINCES:							
Twenty-four Pergunnahs:							
Construction of a new line of Bunds from Kalkapore towards Moneergong, and back to Barreeabaugh, to include the Village of Gillarchut.	- - - - - - -	- Sanctioned 1st June 1841.	-- Twenty-four Pergunnahs.	5,398 14 -	8,333 14 4	- Completion reported season 1844-45.	-- A considerable saving on the estimate was effected by dispensing with a portion of bund where the damming of a khall had sufficed. The estimate for annual repairs of 1850-51 amounts to *Rs.* 15,642. 14. 2.
Construction of 11 Bungalows on these Embankments.	-- For the use of the superintending engineer and the superintendent while on inspection duty.	-- Sanctioned 24th May 1843.	- Ditto - - -	1,070 1 -	- - - -	- Constructed season 1844-45.	-- The inspection bungalows on the embankments in these provinces have been made available to the Magistrates, Collectors, and other Government officers, for occasional use when their duties call them into the interior.
EMBANKMENTS, LOWER PROVINCES:							
Twenty-four Pergunnahs:							
Bunds - - - - -	- - - - - - -	-- The reconstruction of these bunds was sanctioned on the 1st November 1842. Their entire length is 300 miles; the cost of their annual repair is estimated at *Rs.* 18,751. 14. 6.	- - - -	1,30,000 - -	95,160 14 9¾	-- Completed season 1843-44.	-- The estimate for effecting annual repairs of these embankments for season 1849-50 amounted to *Rs.* 14,328. 0. 7.
Ditto - - - - -	-- The construction of a bund has been authorised for the protection of an estate situated on the verge of the Soonderbund Forest, near the Channel Creek.	-- Length 11 miles; commenced in season 1839-40.	- - - -	6,068 - -	6,068 - -	Season 1840-41 -	-- This estate ought, it is stated, to yield at least 20,000 rupees, if properly cultivated; whereas, in its present neglected state, it does not pay to Government one-fourth of that sum. (*continued*)

No. 6.—STATEMENT compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
EMBANKMENTS, LOWER PROVINCES—*continued.*				*Rs. a. p.*	*Rs. a. p.*		
Twenty-four Pergunnahs—continued.							
New Line of Bunds from Calcutta towards Moneergong, and back to Boreebaugh Khal, to include the Village of Gillarchat.	- - - - - - -	- - Length 14 miles, 3 furlongs; sanctioned 1st June 1841.	- - - -	8,333 14 4	8,333 14 4	Season 1841–42.	—
Construction of Hussea Bunds, and Dam across the Khas Mehal Nunnoraj.	- - With a view to the improvement of the mehal.	- - The Bhoorda Khall has been excavated to the length of 3,000 feet, and Husseea three feet in height, with a dam, has been constructed, under orders 19th October 1841.	- - - -	1,248 6 3	- - - -	- - Completed season 1843–44.	- - It is expected that the returns from this estate (8,000 rupees per annum) will be almost doubled, when a proper system of drainage has been established.
CANALS, SOUTH-WESTERN PROVINCES:							
Tully's Nullah: Strengthening Banks opposite to the Kidderpore Tollhouse.	- - - - - - -	- Sanctioned 10th May 1847.	Kidderpore - -	317 10 –	501 5 –	- - Completed season 1847–48.	- - The banks have been protected by piling, and with stone ballast.
CANALS, NORTH-WESTERN PROVINCES:							
Tajjawalla New Cut: Enlargement of the.	- - The width, 40 feet at the base, was found to be insufficient to pass the water accumulated at its mouth.	- - Length about 900 feet, the width at the base to be increased from 40 to 50 feet; sanctioned 24th April 1844.	- - - -	Not reported - - -	1,930 1 2	Season 1844–45 -	- - This cut was originally excavated by Colonel Colvin, immediately below the junction of the two canal heads.
ROADS AND BRIDGES, SOUTH-EASTERN PROVINCES:							
Tumlook Road: Construction of Drain Bridges.	- - The road interfered with the natural drainage of the country.	- - Length 18 miles; sanctioned 27th March and 24th July 1843.	- - From Paunchcoorah to Narrainpore Khaul.	3,126 8 1	3,602 11 8	- - Completed season 1844–45.	- - Such of these drains as it may be desirable to adapt to purposes of irrigation, will have sluice-gates attached to them at the cost of the landholders.

Topechanchee:							
Construction of a Bridge two miles east of.	- - - - - - -	- - Sanctioned 16th October 1843.	- - - -	3,983 11 7	6,009 7 3	- - Completed season 1846-47.	The bridge has two semicircular arches, 22 feet in span. The saving is owing to a great reduction in the quantity of masonry-work, and in the rates generally.
Construction of two Masonry Bridges, one three miles and one four miles east of.	- - - - - - -	- - Sanctioned 16th October 1843.	- - - -	- - - - -	7,013 1 2	- - - -	
ROADS AND BRIDGES, LOWER PROVINCES:							
Tezpore Bridge, in Lower Assam	- - To complete the communication between the station and the gaol.	- - Sanctioned 12th January 1841.	- - - -	716 12 7	841 - -	- - Completed season 1843-44.	—
Titillya Ghaut: Across the Cossyah Hills to Paneegong, in Assam.	- - - - - - -	- - Length 44 miles; sanctioned in season 1838-39.	Paneegong - -	8,888 1 6	- - - -	- - Completed in season 1841-42.	- - The whole line, as it exists now, may be traversed in every part by troops and laden cattle. The bridges are of wood, and being built of large trees, they will answer even for laden elephants.
ROADS AND BRIDGES, NORTH-WESTERN PROVINCES:							
Tongra to Goona: Straightening the Road from, and Construction of a Bridge across a Nullah at Lockwas.	- - - - - - -	- - Sanctioned 1st August 1845.	Goona - - -	1,993 13 11	1,993 13 11	- - Completed season 1846-47.	—
Umbella to Pinjore: Construction of a Military Road.	- - With reference to Government general orders of 17th November 1842, relating to the opening of roads adapted for all military purposes in the North-western frontier.	- - Length 34 miles and 7 furlongs; sanctioned 29th November 1844.	Pinjore - - -	- - - - -	91,081 8 6	- - - -	- - The estimate provides for the construction of two bridges across the Labrew Nullah and the Choar, near Moohambpore, and 75 drain bridges of shorts.
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—JUDICIAL:							
Twenty-four Pergunnahs: Construction of a New Insane Hospital.	- - - - - - -	- - Sanctioned 26th January 1844.	- - Situated between the Sudder Dewannee Court-house, and the Iron Bridge-yard.	47,847 15 5	47,322 5 10	- - Completed season 1848-49.	—

(continued)

No. 6.—Statement compiled from the Reports of the Military Board at Bengal, from Season 1839–40, to 1850–51 inclusive—*continued*.

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—JUDICIAL—*continued*.				*Rs. a. p.*	*Rs. a. p.*		
Tavoy: Construction of New Buildings.	- - A new house for the gaoler and gaol cooking-sheds; the former required to replace the gaoler's house, which had decayed; the latter in lieu of the present sheds, which, from their objectionable position, affords means of escape to prisoners.	- - Sanctioned 26th March 1845.	Tavoy - - -	1,253 10 9	1,751 3 –	- - Completed season 1846–47.	—
Construction of Circuit-houses and Out-offices.	- - - - - - -	- - Sanctioned 17th September 1845.	Tavoy - - -	- - *Rs.* 3,893. 6. 8. was incurred in the construction of the Circuit-house.	7,527 13 6	- - The completion of the Circuit-house was reported in season 1847–48.	—
CIVIL BUILDINGS, LOWER PROVINCES—JUDICIAL:							
Tëzpore, in Lower Assam:							
Construction of a Treasury and Record-rooms.	- - To secure the records of the magistrate's office.	- - Sanctioned 30th March 1841.	Tëzpore - - -	4,589 14 4	2,563 2 4 Exclusive of convict labour.	- - Completed season 1846-47.	—
New Gaol - - - -	- The existing gaol building being in a very dilapidated state.	- - Sanctioned February 1841.	Tëzpore - - -	13,923 1 5	13,805 12 6 This amount, it is expected, will be considerably reduced by the employment of convict labour.	- - Completed season 1846–47.	- - This consists of four criminal, one nazut, one civil, one female, and one hospital ward, with dead-house and out-offices. The whole of the buildings are of kutcha pucca masonry, with thatch roof, with the exception of the cook-rooms, which have tiled roofs.
Construction of a Thatched Roof Cutcherry.	- - At the requisition of the Commissioner of Assam, in lieu of the present cutcherry, which is in a dilapidated state.	- - Sanctioned 24th June 1846.	Tëzpore - - -	4,299 15 4	4,402 - -	—	
Additions of Cutcha Pucca Walls to the Circuit Bungalow.	- - In lieu of the present temporary walls, which are liable to be destroyed by storms.	- - Sanctioned December 1845.	Tëzpore - - -	- - - - -	2,008 - -	—	
CIVIL BUILDINGS, SOUTH-EASTERN PROVINCES—GENERAL:							
Tavoy: Construction of a New Wharf.	- - In lieu of the old wharf, which is in a decayed state, and of little use except at high water, owing to there being a space of 73 feet of soft mud between it and the stream.	- - Sanctioned 9th September 1844.	Tavoy - - -	1,778 11 2	1,778 11 2	Season 1844–45.	—

CIVIL BUILDINGS, LOWER PROVINCES—GENERAL:							
Titalya; Construction of a Staging Bungalow and Out-offices.	To provide accommodation to travellers to and from Darjeeling.	22d September 1847	Titalya	3,317 4 9	An advance of 2,000 rupees was made. An estimate, amounting to *Rs.* 3,230. 14. 8. was subsequently (5th September 1848) sanctioned.		Will supply the place of an hotel which existed at the spot, but was burnt down in 1847. In season 1849–50 a sum of *Rs.* 148. 7. 7. was expended in furnishing this bungalow.
CIVIL BUILDINGS, CENTRAL PROVINCES—REVENUE:							
Toshaum, in the District of Hissar: Construction of a Tuhseeldarry Cutcherry at.	- - - - - - - -	Sanctioned 1839–40	Toshaum	3,568 3 7	3,568 3 7	Season 1839–40.	—
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—REVENUE:							
Tirwah: Construction of Buildings.	For the accommodation of the Tuhseel and Thannah establishments.	Sanctioned 18th February 1846.	- - - - - - - - -	7,127 – –	- - - -		The execution of this work was entrusted to the civil officer.
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—GENERAL:							
Umballah: Staging Bungalow at	For the convenience of travellers proceeding to or from Simla.	Sanctioned 1839–40	Umballah	1,645 4 5	1,645 4 5	Season 1840–41.	—
Umballah Church: Purchase of the Private Church.	- - - - - - - -	Sanctioned 8th December 1846.	Umballah	3,000 – –	- - - -	Purchased season 1846–47.	The sum of 3,000 rupees provides also for alterations and purchase of church furniture.
Umballah:							
Construction of a Dawk Bungalow.	To provide good accommodation for travellers at the station, through which many of the servants of Government are continually passing.	Sanctioned 3d October 1848.	Umballah	8,291 4 9	9,896 10 7	Completed season 1849–50.	The contemplated outlay, although large, is not considered incommensurate with the object in view.
Construction of Bathing-houses and Pucka Well.	For the accommodation of travellers passing through Umballah.	Sanctioned 29th October 1849.	Umballah	1,158 13 6	- - - -	Completed season 1850–51.	The number of travellers passing through Umballah is very great, and the private accommodation is limited to four suites of apartments.
CIVIL BUILDINGS, NORTH-WESTERN PROVINCES—JUDICIAL:							
Umballah: Construction of Buildings.	For the police battalion - -	Sanctioned 12th June 1844.	Umballah	8,634 14 10	- - - -	Completed season 1846–47.	These buildings consist of a bungalow, with out-offices for the adjutant, a magazine, eight bells of arms and a rear-guard, and are constructed of permanent materials.

No. 7.

A STATEMENT exhibiting the EXPENDITURE incurred under the Presidency of *Bengal* on WORKS, SALARIES, ESTABLISHMENTS, &c. in the CIVIL DEPARTMENT of PUBLIC WORKS within the Ten (10) Years from Season 1839–40 to Season 1848–49 inclusive, from the Military Board Office Bill Books, will be found at Page 154 of the Printed Parliamentary Paper of the Honourable the House of Commons, No. 622 of 1851, the Total Amount being—

		Rs.	*a.*	*p.*
		2,23,65,343	15	1
The Expenditure for Season 1849–50 was - -		29,29,480	–	10
Ditto - - - ditto 1850–51 was - -		32,10,067	7	6
TOTAL for Season 1839–40 to Season 1850–51 inclusive - - - - -	*Rs.*	2,85,04,891	7	5

PRESIDENCY OF FORT ST. GEORGE.

No. 8.

In the printed Parliamentary Paper of the Honourable the House of Commons, No. 622 of 1851, pages 154 to 158, particulars are given of the formation of the Department of the Superintendent of Roads, of the arrangements adopted for the management and classification of the trunk roads, and of their condition, to the 1st May 1848. The following additional information has since been furnished in a General Report on the Road Department, to the 1st May 1851, dated 17th October 1851, in which year a new line from Madras to Cuddapah by the Goolcherroo Pass from Garampilly, was classed as Trunk Road No. 12; the old direct road to Cuddapah from Kankaloor, by the Valley of Chitwail, was thenceforth to be classed as a minor branch road.

Trunk Roads.

No. 1.—*Western Trunk Roads, Madras, towards Bangalore.*

The traffic on this road is so great as to make it of primary importance in a commercial point of view; the portion of it which lies between Madras and Waniambaddy, 121 miles, was reported in January 1852 to be perfectly made and bridged throughout, with the exception of the Palaur River, 2,440 yards wide, between Arcot and Vellore, its two branches near Waniambaddy, respectively 180 yards and 130 yards, and the Agarum River, 850 yards wide, between Pulliconda and Amboor; a new road four miles in extent, and partly in the town of Waniambaddy, has been opened for use, while a road for carts, between the 18th and 60th miles, with improvements of the road between Waniumbaddy and Bangalore, are the further works proposed to be undertaken; 352 carts per day, on the average, pass on 125 miles on this road, and in consequence of this great traffic 57,496 rupees were expended on repairs in 1851; and a sum of *Rs.* 31,179. 14. was demanded for the following season. The amount laid out on the Western Road from May 1845 to May 1851 was *Rs.* 3,30,655. 9. There are altogether 566 bridges, with an aggregate of 668 arches, and 3,984 feet of water-way, besides 78 road dams, over which water runs occasionally.

No. 2.—*Frazerpett, on the Cauvery River, to Mangalore.*

The portion between Mangalore and Frazerpett, a distance of 101 miles, has been much improved throughout. A bridge of an oblique arch of 42 feet has been constructed in lieu of one of two arches of 18 feet span, carried away in 1847, estimated at *Rs.* 2,024. 9. 9., but only cost *Rs.* 1,245. 14. 9.; and another of one arch of 45 feet is being rebuilt at Feringypett, at an estimated cost of *Rs.* 5,620. 3. 9. A branch road, practicable for carts, has been opened from Pootoor to Oopinungady, the object of which is to enable "carts that travel between Buntwall and the Munzerabad Ghaut to avoid the difficulty between the former place and Oopinungady, by following the Road No. 2 as far as Pootoor."

No. 3.—*From the North Western part of Mysore, towards Canara, by a Pass descending from the Table Land near Munzerabad.*

This road extends from Mangalore to Bangalore, by the Munzerabad Pass, and is now nearly completed from Mysore to Oopinungady, a distance of 112 miles. An estimate of 30,000 rupees for carrying it 18 miles further on from Oopinungady to Buntwall is under revision.

No. 4.—*From Hoonsoor, in Mysore, to Cannanore by the Parumbaddy Pass.*

Advances to the amount of *Rs.* 1,83,135. 5. 2. were made up to 1st May 1851. In March 1851 this road was reported nearly completed from Cannanore to the Mysore frontier. The road by this Ghaut has been in continual use since May 1848. It is considered that an expenditure of 100 rupees per mile, per year, will be required to keep the road in order.

No. 5.—*From Waniambaddy, by Salem and Coimbatore, to the Western Coast at Ponany.*

Between Walliaur and Ponany, a distance of 70 miles, a bridge of five arches of 39 feet, over the Nurgumpully, and another of one arch of 36 feet, over the Yettaditooloo, have been built; a bridge of 10 arches of 45 feet, over the Parlakadow, will be completed in 1852. A new road from Coimbatore to Waliaur, a distance of 15 miles, has been completed, and a bridge of 26 arches of 47½ feet span, over the Cauvery, between Bowany and Comarpollium, has been opened for use. A new direct line of road between Avernashy and Bowany, and further improvement of the road between Waniambaddy and Comarpollium, are proposed.

No. 6.—*Great North Road from Madras to Calcutta.*

The portion of road between Goomdipoondy, in the district of Chingleput, and Ulloor in that of Nellore, is far from being complete; the portion between Nellore and Ulloor will be superseded by a more favourable line through Mocberla to Tungatoor. The road from Madras to Goomdipoondy will be bridged, also three streams between Goomdipoondy and Nellore. From Nellore to Ongle the road has been re-surveyed throughout, and a new line marked out between Covoor and Tungatoor. An excellent road has been made from Vizianagarum to Bimlipatam, at the expense of the Zemindar of Vizianagarum, and a bridge over the Bimlipatam River is being constructed at the expense of Government.

No. 7.—*From the Great North Road near Ongle, to the Nizam Frontier.*

The traffic on this road is exceedingly trifling, and the road is only of importance as being on the route by which troops march from Madras to Hydrabad.

No. 8.—*Inland Southern Road, as far as Trichinopoly.*

The portion of road from Chingleput to Ooloondoorpett (95 miles) was reported in 1851 to be constructed, and would be metalled in the next year; the road from the north bank of the Cauvery to Samiaverem has been completed, and a beautiful and convenient approach made to Trichinopoly. A bridge of 32 arches of 45 feet span has been built over the Cauvery, and another of 32 arches of 60 feet span, over the Coleroon, is under construction. A road has been surveyed between Toramungalum and Sirooganoor, and estimates have been sanctioned for a bridge over the Chinaur, and a causeway over the Oopaur. When these works are completed, the Palar at Chingleput will form the only obstacle to rapid travelling between Madras and Trichinopoly.

No. 9.—*Proposed to branch from No. 8, and take a more easterly direction, so as to lead to the new Annicut, lately built over the Vellaur River, thence across the Coleroon River at its lower Annicut, into the Tanjore District, near Combaconum and Myaveram.*

The principal works executed are, a road south of the Coleroon Annicut, and a bridge of 19 arches of 31 feet, built above the Annicut, over the Vellaur; the road from the lower Coleroon Annicut to Vikravandy, 64 miles, has been cleared of jungle, and marked out, and a bridge over the surplus channel from the Toollajah Tank, and another over the Vuddavaur, with a new head sluice to the South Rajah Voikal, will be far advanced, if not finished, in 1852.

No. 10.—*Proposed Road from Madras through Chittoor, Palmanar, Balsamoodram, to Bellary.*

The principal works under construction are, roads from Raneepett to Punautoor, from Punautoor to Chittoor, and from Chittoor to Palmanair; these roads would be opened and the bridges finished in June 1852.

No. 11.—*New Line from Madras by Roychotty, the Goolcherroo Pass, and Cuddapah, to Bellary.*

The line from Madras to Codairy has been surveyed, and the portion of it from Madras to Cavetrajpett, near Poinay, has been marked out and estimated. Improvements are suggested to bring this road into general use, and to relieve the road from Madras to Poonamallee of a large number of carts carrying Bungalore, Cuddapah, and Bellary goods; thus reducing the wear and tear, and diminishing the expense of maintaining that portion of Trunk Road No. 1.

No. 12.—*From Madras to Cuddapah, by the Goolcherroo Pass from Garampilly.*

The principal work done on this line, has been the improvement of the Goolcherroo Ghaut, on the road from Roychoty to Cuddapah; improvements have also been made to the old direct road to Cuddapah from Kankaloor by the valley of Chitwail, which it is proposed should henceforth be classed as a minor branch road.

No. 9.

MADRAS DISTRICT ROADS.

PARTICULARS as to the state of these roads, compiled from reports of the collectors, submitted by the Government of Fort St. George to the Honourable the Court of Directors, under date 6th May 1850, will be found at pages 158 to 165 of the printed Parliamentary Paper of the Honourable the House of Commons, No. 622 of 1851. The following is a statement of the more important works executed under the Civil Engineers' Department in the years 1848 and 1849.

No. 9.

INDEX to STATEMENTS of WORKS Executed by the CIVIL ENGINEERS DEPARTMENT during the Years 1848 and 1849.

NAME OF WORK.

No. 16. Absanagrum Tank, repair of the Bank of.
24. Arbyle Ghaut, and line of Road from Yellapoor to Meerjan.
32. Agoomby Ghaut, Road from the foot of the, at Somaishwar to Bujjay.
33. Agoomby Ghaut, Road from the foot of the, at Somaishwar, to Halandee.
41. Araselaur River, Bridge over.
82. Annamullay Teak Forest, examination of.
94. Ambasamooduram Bridge, flooring to six of the Arches of.
7. Cocanada, Lattice Bridge at.
18. Construction of Sluices to different Tanks.
23. Coloor Ghaut.
27. Cassergode and Solea Road.
35. Cauvery Pauk Tank repairs.
38. Calavaye Tank Calingulah.
47. Corayaur River, Bridge over the.
48. Cuddaveyaur River, Bridge over the.
59. Covellay Surplus Channel, extending the.
67. Cauvery River, Bridge over, at Trichinopoly.
72. Coleroon River, repairs of the Banks of.
78. Calicut Canal (Malabar).
89. Coonoor Annicut, restoration of the.
100. Cunnadien Channel, from an Annicut across the Tambrapoorny.
5. Dhowlaisweram, permanent Railroad to.
22. Davamunny Ghaut and Road.
87. Dindigul and Pulney, repairs to Road No. 2, between.
11. Ellore and Masulipatam, Road and Bridges on the Road between.
1. Godavery Annicut.
8. Godavery Guttoo Annicut.
36. Goonamadee Calingulah.
31. Honore Jetty.
80. Hassanoor Ghaut.
12. Kristnavarem Limekiln.
14. Kundlairoo, Annicut across the.
75. Khansaibs Channel, Bridge across the.
74. Laulpett, improving the Road from, through Manargoody, to Womampillioor.
21. Munjerabad Ghaut and Road.
25. Mangalore and Agoomby Road.
45. Mercalcurray River, improvement of.
51. Moodecondaun River, Bridge over.
73. Manargoody and Chellumbrum, improving the Road between.
83. Madura, New Sepoy Lines in the Town of.
84. Madura, improvement of Drainage in Town of.
95. Madras to Quilon, repairing High Road, No. 4, from.
104. Madras to Quilon, repairs on the High Road from, in several Talooks.
105. Mailacul Channel, from the Murdoor Annicut.
6. Narsipoor, Road from, to Cakarapurroo.
19. Nellore Tank, completion of new Channel of supply to.
37. Notairy Otairy Calingulah.
40. Narasinga Cauvery River, improving the.
49. Nundalam River, Bridge over the.
56. Negapatam, improving the Port of.
60. Nadookurray Main Channel, improving the.
76. Nundimungalum Oopenaur River, Bridge across the.
93. Nully Oday, Bridge across the.
99. Nenmany Annicut Channel and Tank.
28. Oopenungady and Pootoor Junction Road.

NAME OF WORK.

No. 85. Oopaur River, improvement of Road to, and construction of Bridge over the.
9. Poolapurty Annicut.
10. Pedda Oopalem Channel, Annicut across the.
15. Pennair, opening of a new Channel from the.
52. Pootaur, Bridge over the.
53. Paumany River, Bridge over the.
54. Point Calimere, Beacon Column at.
64. Peravully Channel, improving the.
65. Pungoony Channel, improving the.
77. Perambaddy Pass, Line from the frontiers of Coorg to the Coast at Cannanore.
88. Panlaur River Wagganies.
106. Paupancaul Channel, from the Carapanuddee.
61. Rettenagoody Annicut, extending the, and widening the Nuttud Nullah Channel.
3. Samulcottah Channel.
13. Survapully Channel.
17. Survapully Talook and Bodelingumpaud Cutcherries.
26. Sircy and Darwar Road Bridges.
44. Shembu Cauvery River, head Sluice of the.
92. Shevacausee, Cotton Gin House at.
103. Streevigoontum, Talook Revenue and Police Cutcherry in.
2. Thoolia Bagah Channel.
42. Trimulrajen, Bridge over the.
50. Trimulrajen, Bridge over, on the road from Combaconum to Negapatam.
55. Tranquebar, Beach Defences at.
62. Trichinopoly, improving the Road from, along the right bank of the Cauvery.
63. Trichinopoly, Gaol at.
68. Trichinopoly, new Road from, to Towagoody, the first stage to Tanjore.
69. Trichinopoly, constructing part of Road from, to Arrialoor.
70. Trichinopoly, improving the Road from, to Laulgoody.
81. Teppacandoo Bridge.
86. Thiroopoovanum Channel, Bridge across head of.
96. Thimmarajasamoodrum Cooticaul Annicut, reconstruction of.
97. Thirtangul Pereacolum, restoration of the.
98. Thentherapairee Head Sluice, repair of the.
101. Tinnevelly Channel from the Sootamullay Annicut across the Tambrapoorny.
102. Teutacorin, New Sea Custom-house and Maste. Attendant's Office at.
39. Vuddavaur River, improving the.
43. Veerasholen River, Bridge over the.
46. Valavanaur River, improvement of the.
66. Vitticutty Main Channel, improving the.
71. Vuddavaur River, widening the, and forming a Dike on its left bank.
90. Vigay River, rebuilding Causeway across.
91. Vaddakurray Tank, supplying Channel of.
20. Wullabapoor Annicut, reconstruction of.
34. Wotairy Nullah, Embankment Channel and Bridge across the.
57. Weyacondaun Channel, improvement of the.
58. Weyacondaun Channel, rebuilding of Dark's Bridge across.
4. Yanam Embankment.
29. Yellapore and Moondagode Road.
30. Yellapore and Halliaul Road.
79. Yenudmuckle Apron.

No. 9.—PARTICULARS of some of the more important of the WORKS executed under the MADRAS CIVIL ENGINEERS' DEPARTMENT, in the Years 1848 and 1849; extracted from the Divisional Reports.

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
FIRST DIVISION.							
Rajahmundry District:				*Rs. a. p.*			
(1.) Godavery Annicut	For irrigation			Total expenditure to end of 1849, 6,59,344			The opening of the quarries, laying rail-roads, building stone dams, construction of the Dhowlaisweram and Muddoor Branch annicuts, and lock and sluices at various places.
(2.) Thoolia Bagah Channel	Clearing the old channel, and embanking.	Commenced in 1846	Cocanada River	16,929			Average collections: 1840 to 1845 - 34,541 rupees. 1849 - 52,232 „ Increase - 17,691 „
(3.) Samulcottah Channel	For irrigation	27 miles in length		4,644			Chiefly for sluices. This is an entirely new line, carried through a tract of country almost without water, excepting some tanks dependent on the local rains: it is a striking proof of the value of water, the average collections having risen from 25,280 rupees to 30,486 rupees in 1846–47, and 36,093 rupees in 1847–48, and 47,910 rupees in 1849.
(4.) Yanam Embankment				8,120			This embankment, carried along the eastern side of the Godavery, was utterly inefficient previous to 1848.
(5.) Permanent Railroad to Dhowlaisweram.	For the permanent use of the district.			5,410			Leading from the Quarry Hill to the bank of the river.
(6.) Road from Narsipoor to Cakarapurroo.	To connect Narsipoor with Rajahmundry.	Length, 24 miles	Cakarapurroo	9,407			Expenditure incurred in the erection of bridges and tunnels, and repairs to the road-way.
(7.) Lattice Bridge at Cocanada		Length, 240 feet between the abutments, in three bays of 50 feet each, and two of 40 feet.		1,065 balance of a contract of 2,400 rupees.		Finished in 1848	This was a first experiment to ascertain the cost and efficiency of a mode of construction so extensively used in America, and which has also been adopted in England. It has been of the greatest use, many thousands of people passing over it daily.
Vizagapatam District:							
(8.) Godavery Guttoo Annicut	For damming up the water which flows down the river, to supply irrigation to a tract of country paying revenue to the amount of 15,900 rupees.	Length, 324 feet		3,187		Completed; date not given.	Constructed across the Shadah Nuddee, near Cassimcottah.
(9.) Poolapurty Annicut	To cause the water which comes down the river, instead of running waste into the sea, to be stored up in several tanks or reservoirs for irrigating lands in the Survasiddy Talook, assessed at 11,600 rupees.			1,712			Constructed across the Pundaroo River.

(*continued*)

No. 9.—PARTICULARS of some of the more Important of the Works executed under the Madras Civil Engineers' Department, in the Years 1848 and 1849, &c.—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
FIRST DIVISION—*continued.*							
Vizagapatam District—continued.				*Rs. a. p.*			
(10.) Annicut across the Pedda Oopalem Channel.	-- For turning the River Pundaroo into its right course.	- - - -	- - - -	830 - -	—		
Masulipatam District:							
(11.) Road and Bridges on the Road between Ellore and Masulipatam.	-- For making the passage of irrigating channels practicable for bandies at all seasons.	- - - -	- - - -	4,029 - -	- - - -	- - - -	-- Nearly 40,000 bullocks pass over them yearly with salt alone, to the Hyderabad territories, which before were weeks in the monsoon, waiting till the water fell to ford the rapid streams.
(12.) Kristnavarem Lime Kiln -	-- For supplying lime for all the contemplated bridges on No. 6 Trunk Road.	- - - -	- - - -	143 - -	—		
SECOND DIVISION:							
Nellore District:							
(13.) Survapully Channel -	- - - - - - -	- - - -	- - - -	1,751 - -	- - -	- - - -	-- Leads off from the Pennair River, and after running a course of nearly three miles, branches into three channels. Passes on the western side of the town of Nellore, and is spanned by three bridges and an aqueduct built of laterite stone. The revenue derived, in 1848–49, from the tanks depending upon the Survapully River channel for their supply of water, was 12,506 rupees.
(14.) Annicut across the Kundlairoo.	-- To afford a better supply of water to the tanks of Buolvole, Collecoodooroo and Cutwapully, of the Survapully talook.	-- Length, 90 feet; commenced, May 1849.	- - - -	3,090 - -	- - - -	Completed, July 1849	-- The body of this work is 90 feet long by 4 ½ wide on the average, and six feet high, of laterite stone. Standing on a foundation 8 feet deep and 8 ½ feet broad on the average, supported by wing walls of brick in chunam 12 feet high, with buttresses, and further strengthened by an apron of rubble stone, 33 feet wide, which was secured by a retaining wall sunk 9 feet deep in the bed of the river.
(15.) Opening of a new Channel from the Pennair.	-- For the better supply of the Nellore tank.	-- Rather more than five miles in length.	- - - -	6,512 - -	- - - -	- - - -	-- This is a capacious reservoir, capable of irrigating 2,143 goortoos of land, the ayacut revenue of which is 32,167 rupees, but of late years the average revenue derived from it is only about 18,000 rupees.
(16.) Repair of the bank of the Absanagrum Tank in the Calagherry Talook.	- - - - - - -	- - - -	- - - -	2,965 - -	- - - -	- - - -	-- In 1847, this tank was breached in several places; this expenditure was therefore necessary to protect existing revenue.
(17.) Survapully Talook and Bodelingumpaud Cutcherries.	- - - - - - -	- - - -	- - - -	4,194 - -	- - - -	- - - -	-- Constructed of brick in chunam, with beams of teak wood, and palmyrah rafters and reepers.

(18.) Construction of sluices and calingulahs to different tanks.	- - - - - - - -	- - - -	- - - - -	6,234 - -	—	
(19.) Completion of the new channel of supply to the Nellore tank.	- - - - - - - -	- - - -	- - - - -	2,315 - -	- - - -	Completed 1849 - - The revenue, which in 1844–45 was 10,882 rupees, was, in the season of its completion, 1848–49, 18,234 rupees.
THIRD DIVISION.						
Bellary:						
(20.) Reconstruction of the Wullabapoor Annicut.	- - - - - - - -	Commenced 1846–47	- - - -	Not stated - -	- - - -	- - Completed in May 1848. - - This work is a dam across the Toombudra River, 44 miles west of the town of Bellary. The chief executive difficulty was to keep the work free from sudden freshes, as also from the water above, which throughout the dry season stands from 8 to 12 feet above some of the rocks on which the foundations of the work are laid.
Canara:						
(21.) Munjerabad Ghaut and Road.	- - Constructed in lieu of the Bissly Ghaut Road.	- - Length, 30 miles; commenced 1842–43.	- - - -	62,461 - -	- - - -	- - Expected to be completed in June 1852. - - This line leads from Munjerabad, in the Mysore country, towards Mangalore *vid* Oopenungady. A few carts only have yet been on the line, owing to a part of it being impracticable for cart traffic.
North Canara:						
(22.) Davamunny Ghaut and Road.	- - - - - - - -	Length, 30 miles -	- - - -	42,619 - -	- - - -	June 1851 - - This line leaves the old Sircee and Neelcoond road in the Baldghat of North Canara, about nine miles from Sircee, and passed over the ghauts at Davamunny, a few miles to the north of Neelcoond; early in 1848 it was first passable for carriages, but as a number of rivers and nullahs still required bridging, it was not until the end of 1849 that it was much used by carts conveying cotton from the interior. Numbers of these vehicles, as well as bullocks, were met with at every turn of the road. One large bridge and several of minor importance are still required.
(23.) Coloor Ghaut - - -	- - - - - - - -	- - Length, 5 miles; commenced 1847.	- - - -	8,000 - -	- - - -	Completed 1848–49 - - Nearly midway between the Munjerabad and Davamunny Ghauts. When complet d, the roads above the ghaut will lead to it from Anantapoor, Shikarpoor, and Shemoga, and below; junction lines are in progress from the foot of the ghaut to Coondapoor and to Byndoor, a small port nearly due west of the ghaut. The general course of the old line of road has been selected, and though not very easily practicable for carts, it is considered very easy for bullocks and horses.
(24.) Arbyle Ghaut and line of road from Yellapoor to Meerjan.	- - - - - - - -	Length, 45 miles -	- - - -	3,091 - -	- - - -	- - - - - - The slope of this road is very gentle, and easily practicable for bandies; it is being carried on from between Soonksal and the River Gurgawully. A branch line to Ancola, about 15 miles in length, is being surveyed.
(25.) Mangalore and Agoomby Road.	- - - - - - - -	Length, 60 miles -	- - Southern parts of the Nugger district of Mysore.	5,691 - -	- - - -	- - - - - - Leads through Goorpoor, by the foot of the Agoomby Pass, to the southern parts of the Nugger district of Mysore. This road has been made practicable for carts as far as Yenna, Nolay, Mutt, and will probably be made so throughout, during the next working season.
(26.) Sircy and Darwar road bridges.	- - - - - - - -	- - - -	- - - -	15,668 - -	15,724 rupees - -	- - Completed, season 1849–50. - - To complete the line of road from Sircy to Darwar district frontier with substantial bridges. The span of the largest of these bridges, the Jhendagherry bridge, rebuilt in 1848–49, is 42 feet; the road beyond the frontier is under the superintendence of the Bombay officers. It is expected by season 1850–51 that from the sea coast at Coompta to Darwar the road will be practicable throughout the year for wheeled carriages.

(*continued*)

No. 9.—PARTICULARS of some of the more Important of the Works executed under the Madras Civil Engineers' Department, in the Years 1848 and 1849, &c.—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
THIRD DIVISION—*continued.*							
North Canara—continued.							
				Rs. a. p.	*Rs. a. p.*		
(27.) Cassergode and Soolea Road.	- - - - - - - -	- - Length, 29 miles; commenced 1849–50.	Jaulsoor - - -	1,645 - -	- - - -	Next working season	- - This is a branch line from the sea coast at Cassergode to Jaulsoor, near Soolea, about 12 miles from the foot of the Sirmpajee Ghaut; nearly half the road work has been completed. Like most of the other lines leading from the coast towards the ghauts, a good deal of thick jungle has to be cleared away, and many precipitous hills surmounted.
(28.) Oopenungady and Pootoor Junction Road.	- - - - - - - -	- - Length, 8 miles; commenced 1849–50.	- - - -	1,175 - -	- - - -	- - - -	- - The estimate does not provide for any masonry works, with the exception of a few small tunnels; the larger nullahs have been temporarily bridged with trees, cut down in the neighbourhood. Owing to the depth of water at the ferry at Oopenungady, and the rocky bed at other parts, carts will not be able to cross without being unloaded.
(29.) Yellapoor and Moondagode Road.	- - To connect the Darwar and Sircy line with the top of the Arbyle Ghaut.	- - Length, 25 miles; commenced season 1849–50.	- - - -	1,269 - -	- - - -	- - - -	- - The main obstacle on this line is the Baidti nullah, which will be bridged.
(30.) Yellapoor and Halliaul Road.	- - To connect the northern parts of the Soopan Talook with the head of the Arbyle Ghaut.	Length, 30 miles -	- - - -	- - -	4,625 - -	- - Expected time of completion, end of April 1851.	- - The line twice crosses a large nullah, over which wooden bridges will be erected.
(31.) Honore Jetty - - -	- - As a breakwater to protect the custom-house and adjoining warehouses from encroachments of the sea.	- - - -	- - - -	1,766 - -	- - - -	Completed 1848–49 -	- - Appears to have fully answered the purpose. The wharf, walls, and other conveniences for shipping and landing goods have been much improved.
(32.) Road from the foot of the Agoomby Ghaut at Somaishwar to Bujjay.	- - Completed for the purpose of connecting the Agoomby Ghaut with the head of the navigation of the Nullah (Savourna Nuddy) which runs into the backwater two miles south of Bramahwar.	Length, 18 miles -	Bujjay - - -	4,479 - -	4,483 - -	- - Completed; date not given.	Estimates for bridges are being prepared.
(33.) Road from the foot of the Agoomby Ghaut, at Somaishwar, to Halandee.	- - For the purpose of connecting the foot of the Agoomby Ghaut with the head of the navigation of the large nullahs running into the broad backwater east of Coondapoor.	Length, 15 miles -	Halandee -	2,274 - -	2,239 - -	- - Completed; date not given.	- - This road has been made practicable for carts throughout.
FOURTH DIVISION.							
Chingleput:							
(34.) Embankment, channel, and bridge across the Wotairy Nullah.	- - To divert the waters of the nullah into the Coum River, to prevent them, as hitherto, overflowing the Perambore lines, near Madras.	Length, 492 yards -	- - - -	1,441 11 -	- - - -	Completed 1849 -	- - The work is considered a great boon by persons in Perambore.

North Arcot:							
(35.) Cauvery Pauk Tank repairs.	- - - - - - -	Length, 3¾ miles -	- - - - -	- - - -	- - - - -	- - - - -	- - The bank of the tank is 3¾ miles in length, reveted throughout, and is 22 feet high in the inside. The revenue collected from cultivation for the last 20 years amounts to 804,293 rupees; the repairs to 97,605 rupees.
(36.) Goonamadee Calingulah -	- - Built in the supply channel of the Cauvery Pauk Tank, at a place where it was continually being breached.	- - - -	- - - -	2,516 - -	- - - - -	- - - - -	- - This is a satisfactory work. This work was very necessary; the Cauvery Pauk supply channel is now in good order.
(37.) Notairy Otairy Calingulah.	- - - - - - -	- - - -	- - - -	2,069 - -	2,460 - -	- - Completed; date not stated.	- - The work has been almost entirely rebuilt; the wing walls are 23 feet high; the apron is entirely of dressed granite.
(38.) Calavaye Tank Calingulah.	- - - - - - -	- - - -	- - - -	1,589 - -	- - - - -	- - - -	- - The surplus water from the calingulah of this tank has an overfall of 11 feet; the apron, which is 5 feet thick of solid stone and chunam, with a good rear retaining wall, and covered with dressed granite, has been rebuilt in a most substantial manner.
SIXTH DIVISION.							
Tanjore:							
(39.) Improving the Vuddavaur River in the Paupanassum and Manargoody Talooks.	For irrigation - - - -	- - - -	- - - -	5,965 - -	6,403 - -	- - Completed; date not stated.	- - The Vuddavaur branches from the Vennaur River about 10 miles west of Tanjore, and irrigates an extent of land equal to 7,014 acres, bearing a revenue of 25,969 rupees. The lower part of the river course has been enlarged, and several sharp bends cut, the result of which has been highly satisfactory.
(40.) Improving the Narasinga Cauvery River in the Puttacottah Talook.	For irrigation purposes - -	- - - -	- - - -	2,196 - -	2,196 - -	Completed - -	- - This river branches from the Vellaur, and irrigates a great extent of land, principally on shrotrium tenure, but of which 1,183 acres yield a revenue to Government of 5,102 rupees. Owing to freshes throwing sand into the branch, the cultivation had suffered greatly for want of water, and the bed was deepened and widened to increase the supply.
(41.) Bridge over the Araselaur River, on the road from Madras to Negapatam, *viâ* Mayaveram and Shealey.	- - - - - - -	- - - -	- - - -	5,632 - -	6,595 - -	Finished 1848-49 -	- - The bridge is of five oval arches of 30 feet span. The foundations are of wells filled in with cubes of brick masonry, and resting on sand; the rest of the work is formed of brick in chunam. The road is 24 feet wide, including the parapets.
(42.) Bridge over the River Trimulrajen on the same road.	- - - - - - -	- - - -	- - - -	6,765 - -	7,644 - -	- - Completed; date not given.	- - This bridge is of five oval arches of 38 feet span, and resembles the Areselaur bridge in all respects, excepting the foundations, which consist in solid blocks of brickwork resting on a firm bed of clay.
(43.) Bridge over the Veerasholen River, on the road from Combaconum to Tranquebar.	- - - - - - -	Commenced 1848 -	- - - -	2,217 - -	2,510 - -	Completed 1848 -	- - This work was commenced and finished in 1848. The foundations are of solid brick masonry, and the superstructure of the same material. The width of roadway, including parapets, is 24 feet. The utility of this bridge has been very great in facilitating the export of grain from Tranquebar.

(*continued*)

No. 9.—PARTICULARS of some of the more Important of the Works executed under the Madras Civil Engineers' Department in the Years 1848 and 1849, &c.—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
SIXTH DIVISION—*continued.*							
Tanjore—continued.				*Rs. a. p.*	*Rs. a. p.*		
(44.) Head sluice of the River Shembu Cauvery.	To regulate the supply of water -	Commenced 1849 -	- - - -	3,106 - -	3,143 - -	Completed 1849 -	- - The Shembu Cauvery branches from the left bank of the Vennaur, four miles from Tanjore, and irrigates 3,993 acres of land, yielding a revenue of 25,795 rupees. To regulate the supply of water, the sluice was built, consisting of five vents each six feet wide, divided by piers seven feet high, flanked by ample wing-walls, and secured by broad aprons in front and rear; the piers are faced with cut granite, and the aprons covered with granite; the foundations and superstructure are of brick in chunam.
(45.) Improvement of the Mercalcurray River.	- - To prevent the overflow of its banks in the rainy weather.	Commenced 1846 -	- - - -	8,398 - -	9,500 - -	- - Completed; date not given.	- - The Mercalcurry is a stream in the south part of the Cauvery Delta, carrying off the drainage of 15,074 acres of irrigated land, bearing a revenue of 53,476 rupees; it had never been fully embanked, but overflowed the lands west of its channel. The bed of the river has been widened and deepened, and a dike formed. The best results have been obtained.
(46.) Improvement of the Valavanaur River.	- - For deepening and embanking its channel.	- - - -	- - - -	3,672 - -	- - - -	- - - -	- - The Valavanaur is another great draining channel of the Tritrapoondy Talook, and discharges the surplus water from 12,641 acres of irrigated land, bearing a revenue of 42,609 rupees, into the great southern swamp lying between Point Calimere and Adrampatam. This river had never been embanked, and the lands were exposed to constant inundation, and the crops to destruction. The estimate was sanctioned for deepening and embanking the channel, and cutting a new and direct course for its discharge into the swamp. The part completed in 1849 was very efficiently performed.
(47.) Bridge over the River Corayaur, on the road between Tritrapoondy and Mootoopettah.	- - To facilitate the export of grain from Tritrapoondy Talook by the seaport of Mootoopettah, on the southern coast.	- - - -	- - - -	6,341 - -	6,400 - -	- - Completed; date not given.	- - This bridge is of five segmental arches of 32 feet span. This bridge has proved a valuable addition to the means of communication.
(48.) Bridge over the River Cuddaveyaur, on the road from Negapatam to Point Calimere, in the Keevalore Talook.	- - To connect the villages south of Negapatam with the port of Negapatam, as well as to facilitate the communication with Ceylon by the coast road.	Commenced 1848 -	- - - -	7,530 - -	7,867 - -	Completed 1849 -	- - The bridge is of three segmental arches of 35 and 30 feet span across a tidal river. The bridge was finished in a satisfactory manner, and has proved a most important improvement.
(49.) Bridge over the Nundalam River, on the road between Tranquebar and Negapatam, in the Tranquebar Talook.	- - Was built in consequence of the great increase of traffic between Tranquebar and the ports to the southward of it.	Commenced 1849 -	- - - -	10,179 - -	10,631 - -	Completed 1849 -	- - The bridge is of five segmental arches of 38, 35, and 32 feet span; the roadway is 24 feet wide. The construction of this bridge was conducted with the utmost vigour and efficiency, and its completion has conduced greatly to the comfort of a large trading population.
(50.) Bridge over the River Trimulrajen, on the road from Combaconum to Negapatam.	- - Built to open the communication between the large town of Combaconum and the chief seaport of the province.	- - - -	- - - -	5,292 - -	6,458 - -	Completed - -	- - This bridge is of five segmental arches of 30 feet span; the foundations consist of solid brick masonry; the piers and the arches of the same material; the entire work was completed within five months in a perfectly satisfactory manner. The width of roadway is 24 feet, including parapets.

(51.) Bridge over the River Moodecondaun, on the same road.	- - - - - -	- - - -	- - - -	3,841	4,584	Completed - -	- - Of similar construction with the former bridge, except that it is partly founded on wells.
(52.) Bridge over the River Pootaur, in the Cadavassel Talook, on the same road.	- - - - - -	- - - -	- - - -	3,936	3,944	Completed - -	- - This bridge is similar in construction to the above. The advantages resulting from the construction of these three last-mentioned bridges are fully appreciated by the traders and landholders along this important line.
(53.) Bridge over the Paumany River, on the road from Combaconum to Manargoody.	- - Constructed to complete the communication between these two very large towns.	Commenced 1849 -	- - - -	5,842	6,286	Completed 1849 -	- - This bridge is of five oval arches of 30 feet span; the foundations are of solid brick masonry, and the piers and arches, of similar material, were finished in a style of great efficiency. The work proves of the utmost convenience to the people, and being on one of the Salt roads, subserves materially to the convenience of Government.
(54.) Beacon Column at Point Calimere.	- - To distinguish this important position, where the shoals render navigation peculiarly unsafe.	Commenced in 1848 -	- - - -	2,733	2,753	Completed 1849 -	- - At this point the shoals render navigation peculiarly unsafe. The structure consists of a plain Doric shaft 60 feet high, but hollow, in order to be converted, if necessary, into a lighthouse; the foundations are of wells, and the material is brick in chunam, carefully plastered with a fine white surface; the base is faced with stone to a height of three feet, to secure it from the action of salt.
(55.) Beach defences at Tranquebar.	- - To protect the town of Tranquebar from encroachments of the sea.	- - - -	- - - -	5,058	5,155	Completed - -	- - This work is effected by means of groins and planking and pile work.
(56.) Improving the Port of Negapatam.	- - - - - -	Commenced in 1846 -	- - - -	9,009	9,500	Completed 1849 -	- - The work consisted of the excavation of a new channel for the Cuddavagur River to bring its whole volume of water to the sea at Negapatam, and the construction of a small and rude jetty to restrain the mouth of the river and facilitate the shipment and landing of goods. The result has been great increase in the trade of the port.
Trichinopoly:							
(57.) Improvement of the Weyacondaun Channel.	- - Clearing 28 miles of the bed of the channel.	Length, 33 ½ miles -	- - 17 ½ miles eastward of Trichinopoly.	13,748	14,090	Completed - -	- - The channel is led off from the River Cauvery, 16 miles west of Trichinopoly, and flows, including sinuosities, 33½ miles; it irrigates land to the extent of 9,281 acres. The channel has been deepened and widened, and the result is highly satisfactory.
(58.) Rebuilding of Dark's Bridge across the Weyacondaun Channel.	- - In lieu of old bridge, destroyed.	- - - -	Trichinopoly - -	2,656	3,110	Completed - -	- - This channel was crossed near the town of Trichinopoly by an ancient native bridge, or causeway, which caused great obstruction to the free flow of the water, and was most injurious to the cultivation dependent on the channel to the eastward of the town; the old work was demolished, and a new bridge constructed of three segmental arches of 27 and 26 feet span; the width of the roadway is 40 feet. The effect on the channel has been highly beneficial.
(59.) Extending the Covellay Surplus Channel.	- - For increasing the facility of irrigation.	Commenced in 1848 -	- - - -	2,718	2,990	Completed 1849 -	- - The drainage of 1,455 acres of irrigated land was much impeded by the high level at which it was discharged through the Covellay Channel into the Vennaur. The channel was prolonged a mile and a half, by which a fall of nearly four feet was gained; a dam was also constructed for the irrigation of the lands of Killioor.

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No. 9.—PARTICULARS of some of the more Important of the Works executed under the Madras Civil Engineers' Department in the Years 1848 and 1849, &c.—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
SIXTH DIVISION—*continued.*							
Trichinopoly—continued.				*Rs. a. p.*	*Rs. a. p.*		
(60.) Improving the Nadookurray Main Channel.	To prevent its being over-supplied from the Cauvery River.	- - - -	- - - -	8,701 - -	9,258 - -	Completed - -	This channel, branching from the Cauvery on its north side, irrigates the Island of Seringam. The head of the main channel has been extended 3 ¾ miles higher up the course of the Cauvery, and a head sluice built there for regulating the supply of water. The sluice is a work of four vents of five feet each. The irrigation of 4,021 acres of the Seringam island will be materially benefited.
(61.) Extending the Rettenagoody Annicut, and widening the Nuttud Nullah Channel.	To facilitate the flow of water for irrigation.	- - - -	- - - -	10,948 - -	11,278 - -	Completed - -	This annicut is a work of native construction, which serves to carry the Peravully channel (issuing from the Cauvery) across the Oopaur, a large and violent torrent which rises in the neighbouring hills; beyond the Oopaur the channel is called the Nuttud Nullah, and this, after a course of 10 miles, in which it irrigates a large extent of land, finally terminates in the Shengundy Tank. The annicut was much too confined and the nullah too narrow for the vast flood of water that occasionally passed. The addition to the annicut is a solid brick in chunam wall 11 feet high, 12 feet thick at the base, 4 feet at the crown, and 108 feet long, secured by an apron of stone 40 feet wide, and a wing wall of ample dimensions.
(62.) Improving the road from Trichinopoly along the right bank of the Cauvery.	For making the road suitable for traffic at all seasons of the year.	Commenced in 1847	- - - -	8,683 - -	8,683 - -	Completed 1849 -	The chief masonry works consisted of nine bridges, with an aggregate of 14 arches, varying from 9 to 18 feet, viz., of a bridge of one arch of 18 feet span across the Kistnarayapoorum irrigating channel; another of one arch, 12 feet span, across the Chintelwady surplus channel; a bridge of three arches, 10 feet span, across the Pillapolliam surplus; and one arch of 12 feet span across the irrigating channel of the same village; a bridge of one arch, 18 feet, across the Murdoor channel, near Wuddium; another, of 14 feet, over the same channel near Kootitullay; one of two arches, 11 feet, across the Nunga Voikal irrigating channel; one of two arches, 18 feet, across a surplus stream. The roadway of the head sluice was widened by 31 ½ feet by the construction of three arches of 12 feet average span. Other additional channels, and 24 road tunnels have been constructed. This road is available for cart traffic throughout the year.
(63.) Gaol at Trichinopoly -	To provide space for more prisoners, the old gaol being inadequate in space, and defective in arrangement.	- - - -	Trichinopoly - -	14,441 - -	15,975 - -	Completed - -	The old gaol was inadequate in space, and defective in arrangement. The new building is calculated for 500 prisoners, including sick. The buildings are arranged in a double row, with a central passage 50 feet wide. The gaol is surrounded by a boundary wall 15 feet high. The drainage and water supply are complete. This gaol has been very favourably reported on by the judicial and medical officers of the station.
(64.) Improving the Peravully Channel.	For clearing the bed and strengthening the banks of this great channel for about 15 miles.	- - - -	- - - -	4,604 - -	5,113 - -	Completed - -	This channel branches from the north side of the Cauvery above the upper Coleroon Annicut, and its main stream irrigates 9,737 acres, yielding 54,552 rupees. The bed has been cleared, and the banks, for 15 miles, strengthened.

(65.) Improving the Pungoony Channel.	For widening and deepening its channel.	Commenced in 1849	-	2,535	2,581	Completed 1849	The Pungoony Channel is a branch of the Peravully, and acts both as a draining and irrigating channel. The land dependent on it is about 6,201 acres, producing a revenue of 32,182 rupees. The result of the improvements has been a great improvement in the state of the cultivation affected by it.
(66.) Improving the Vitticutty Main Channel.	- - - - - -	Commenced in 1847	- - - -	2,077	2,424	Completed in 1849	The land irrigated is a comparatively narrow strip, about a mile and a half in width, but its means of supply are abundant. A new branch channel from the Cauvery has been cut, and the main channel for 9,000 yards widened and embanked. An old sluice has been enlarged, and a new one constructed; the new sluice has two vents of five feet each.
(67.) Bridge over the Cauvery at Trichinopoly.	- - - - - -	February 1846; length, 1,882 feet.	- - - -	97,414	99,146	Completed 1849	This bridge is of 32 elliptical arches of 49 feet span. The work was commenced in February 1846; in February and April 1847 the works were destroyed by floods. In 1849 the bridge was opened for use. The foundations are on wells sunk nine feet below the bed, which is sand. The piers are 7 ½ feet average thickness, 8 ½ feet high, and the rise of the arch 12 ¼ feet; the width of roadway, including parapets (one foot thick) 27 feet; the total length, from wing to wing, is 1,882 feet; the material throughout is brick in chunam. Average daily traffic in October 1850, foot passengers, 9,061; carts and carriages, 223; bullocks and cows, 484; horses, 20.
(68.) New road from Trichinopoly to Towagoody, the first stage to Tanjore.	- - - - - -	April 1849; length, nine miles.	Towagoody - -	17,578	- - - -	- - - -	The old line was very circuitous, and in bad order; a considerable extent of the land to be traversed is under irrigation; and the Wayacondaun channel crosses the line three times, besides other unfordable irrigating streams. Operations commenced in April 1849, and by the end of that year the following masonry works had been completed: Two bridges, each of three arches of 26 feet span, across the Wayacondaun; one bridge, of three arches, 20 feet span; one of three arches, of 16 feet, across the Covelly surplus channel; one bridge of three arches, of 12 feet, over the Killy Voikal (irrigating channel); a single arch of 24 feet span over the Retta Voikal; an arch of 12 feet over the Tadenvyal surplus channel; besides 27 tunnels, varying from one and a half to eight feet span. The length of road raised and gravelled through paddy fields is three miles, and through dry lands six miles. The road was opened and used in 1849 (though not quite finished); it facilitates the access to many villages surrounded by wet cultivation and watercourses, which previously cut them off from the great local market for their produce.
(69.) Constructing part of road from Trichinopoly to Arrialoor.	- - - - - -	- - - -	- - - -	2,188	- - - -	- - - -	The portion of road extends for 1 ¼ mile across a sheet of irrigated land; and the masonry works include a bridge of five arches across the Coolyaur, and one of three arches over the Pungoony. In 1849 the earthwork of the road was finished and covered with sand; seven tunnels and three small bridges of various dimensions were built.
(70.) Improving the road from Trichinopoly to Laulgoody.	For raising low inundated parts, and building eight tunnels and three bridges.	- - - -	Laulgoody - -	1,347	- - - -	- - - -	This road extends for 10 miles through one of the richest tracts of irrigated land in the district, and being quite neglected for a long period, and unprovided with any bridges or tunnels, it was impassable for carts.

(continued)

No. 9.—PARTICULARS of some of the more Important of the Works executed under the Madras Civil Engineers' Department in the Years 1848 and 1849, &c.—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
SIXTH DIVISION—*continued.*							
Trichinopoly—continued.				*Rs. a. p.*	*Rs. a. p.*		
(71.) Widening the Vuddavaur River, and forming a dike on its left bank in Manargoody Talook.	To improve the means of irrigation.			3,050 – –	3,056 – –	Completed	The Vuddavaur River branching from the Coleroon, supplies the great Veeranum tank, and irrigates about 40,000 acres, yielding a revenue of 2,00,000 rupees. The channel has been widened for a distance of 3¾ miles, and a dike constructed; the result has been the resumption of cultivation on 85 acres of land previously abandoned, and the far more abundant supply of water to the irrigated tract.
(72.) Repair of the banks of the Coleroon in the limits of Goodelapaudy, in Chellumbrum Talook.	To force back a due proportion of the current into the southern branch.			3,230 – –	3,284 – –	Completed	The Coleroon divides into two branches a short distance below the ferry on the road from Madras to Tanjore, the southern branch of which had been greatly filled up with sand. It became necessary to check the great draught of the northern arm by forcing a due proportion of the current into the southern branch, for which purpose an embankment 400 yards in length and five yards in height was thrown across the northern stream, with a view of the additional stream thrown into the southern channel clearing out the sand by which it was obstructed. The embankment remained firm until the extreme freshes in July, when, as was expected, it was breached; after having had the most decided effect in restoring the proportions of the two streams; but the operations could not be considered final.
(73.) Improving the road between Manargoody and Chellumbrum.	For completing the road as far as Laulpett.	Length, 12½ miles	Laulpett	4,896 – –	5,981 – –	Completed in 1850	The road lying across an alluvial plain, subject in many places to inundation, was impracticable for all wheeled carriages, and very difficult even for bullocks. The distance formed under this expenditure is 12¼ miles in both talooks. There are 16 masonry tunnels varying from one to three feet.
(74.) Improving the road from Laulpett, through Manargoody to Womampillioor.	Raising and forming the road for six miles, and constructing seven tunnels.			2,717 – –	2,799 – –	Completed	This is a much frequented road between the district of Tanjore and South Arcot. The road has been raised for six miles, and seven tunnels of three feet span constructed.
(75.) Bridge across the Khansaib's channel, on the road between Manargoody and Chellumbrum.	To enlarge the waterway	Commenced in 1849		3,233 – –	3,244 – –	Completed in 1849	The bridge was injured by a flood in 1847, while unfinished, and it was found necessary to enlarge the water-way. It has one segmental arch of 40 feet span, and was completed in 1849, in a very satisfactory manner. The foundations and superstructure are of solid brick masonry; breadth of roadway 19 feet.
(76.) Bridge across the Nundimungalum Oopenaur River, on the road between Chellumbrum and Sheally.	To obviate the difficulty caused to the traffic.	Commenced in 1848		16,077 – –	16,170 – –	Completed in 1849	This is a great draining stream which falls into the Coleroon; it always caused most serious difficulties to the traffic. The bridge, which is of three elliptic arches of 49 feet span, was finished in 1849: height of the piers 10 feet; rise of the arch 12 feet; breadth of roadway 24 feet, including parapet. The greatest possible advantage has resulted to the extensive traffic on the line.

SEVENTH DIVISION.

(77.) Perambaddy Pass. Line from the frontiers of Coorg to the Coast at Cannanore.	-- To connect the great western trunk road from Madras with Cannanore, with a branch to Tellicherry, on the western coast.	- - - -	- - - -	- - - -	2,00,376 - -	- - - -	-- It is stated that, in 1842, there was no tolerable road from the interior to the great trading town of Tellicherry, or to Cannanore; the only road practicable for wheels being by the Periah Pass, which from its steepness could not be kept in such condition as to be used by bandies during the rainy months, a season in that part of India occupying a third of the year. The roads on this part are most dangerous, from the fevers which infest them, and in consequence of which no inducement will keep the people to their work, and the Ghaut is so situated in a narrow gorge, that it could not be remodelled. The Perambaddy Ghaut makes a descent from the level of Coorg to the plain of Malabar of 3,000 feet in 10 miles, the inclination varying from 1 in 18 to 1 in 24, with a very short grade, 1 in 16. There is no counterslope in any part of the line, and only a few yards of level. Besides the Ghaut, the estimate covers the cost of the road above and below from the frontiers of Coorg to the station of Cannanore, a distance of 80 miles. There is a year's work at least to be done. Besides the value of the line in a military point of view, as an approach to Cannanore, which is not only the principal cantonment and arsenal on the Western Coast, but the port at which a force could be best collected for embarkation on steamers, the trade will be very great, and the benefit accruing will be felt, both by the Astagan division of Mysore and the town of Tellicherry.
(78.) The Calicut Canal (Malabar).	-- 1st Work. The Pyolee Canal, to enable boats passing down the Cottiaddy River to land their cargo at the port of Vuddagherry. 2d. To connect the Ellatoor and Beypoor backwater by a cutting, six miles. One great object of the navigation is to take the rice of Southern Malabar to the talooks in the north, where pepper is the produce. No. 4. To unite the Beypoor River with Ponany, and that town will have an inland water communication with Calicut and all the coast towns as far as Vuddagherry, within 12 miles of Tellicherry, a distance of 60 miles.	- - - -	- - - -	No. 3 Work - - 18,429 - -	No. 2 Work - - 15,333 - -	No. 1 Work - - Completed in 1848.	- - 3d. Calicut Canal. The executive difficulties were a rapid and destructive stream, that in the freshes left the Tambercherry River, and flowed into a small lake through which the navigation had to pass. The cutting was through two parambas, or high laterite ridges. The forcible stream from the Tambercherry threatened to turn the whole current, should it be allowed to flow into the lake, and make its exit by the northern entrance of the canal. This breach was therefore closed, since which much of the lake has been reclaimed for cultivation. No. 4. Tannoor Canal. The work is progressing, but has been delayed by a bed of sand of the finest description, 30½ feet in depth, having been met with.
(79.) The Yenudmuckle Apron	-- To fit a great portion of the bed of the lake for cultivation, which would otherwise be under salt water for six months in the year.	- - - -	- - - -	about 40,500 - -	- - - -	- - - -	-- The works consist of an earthen embankment 550 yards in length, and a calingulah 110 yards from wing wall to wing wall; their effect is to exclude the tide water while the drainage of the country has a free passage to the sea. The dam was destroyed in 1849, in consequence of the piles having been in many cases cut six feet shorter than was planned; the loss by this failure is estimated at 8,758 rupees. A new project has since been sent in for a dam near the sea, on a more secure section and advantageous site.
(80.) Hassanoor Ghaut - -	-- Originally traced as a substitute for the Guzzlehutty, an ancient pass between Mysore and Coimbatore, too steep for wheels.	- - - -	- - - -	23,271 - -	- - - -	September 1849 -	-- This work was left for two years untouched, in consequence of the great loss of life fever had occasioned among the workpeople. This road will be of value to the towns of Mysore, Coimbatore, Trichinopoly, and perhaps Modura, by giving them an easy communication suitable for carts.

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No. 9.—PARTICULARS of some of the more Important of the Works executed under the Madras Civil Engineers' Department in the Years 1848 and 1849, &c.—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
SEVENTH DIVISION—*continued.*				*Rs. a. p.*	*Rs. a. p.*		
81.) The Teppacandoo Bridge				3,000			Over the River Moydur, a main branch of the Bowany, and tributary of the Cavary, having its source on the Neilgherries, its course follows the line of the mountains, its bed at Teppacandoo being nearly on a level with the country, while a few miles lower down it forms a deep and precipitous ravine 1,000 feet deep, the opposite sides of which are not more than from 2,000 to 3,000 feet apart. This curious feature in the plain is known by the name of the Mysore Ditch. In consequence of the loss of life from fever when the bridge was first erected, the new bridge was made of the simplest form, and prepared of teak timber at Hoonsoor, to be put together with the greatest rapidity. The centring was of the rudest kind; a few small straight trees were cut for uprights, and a scaffolding of bamboos lashed together did all that was required. Span of the bridge, 69 feet; height above the bed of the river, 38 feet.
(82.) Examination of the Annamullay Teak Forest.		Commenced 1849					This forest was begun to be worked on account of Government in 1849; it is stated that such wood could be stored at Ponany, on the western coast, for half a rupee per cubic foot, as has cost the Bombay Government hitherto 2½ rupees. The only difficulty anticipated in 1849, was the collection of men sufficient to cut the 100,000 cubic feet required to furnish the several departments in Bombay and Madras.
EIGHTH DIVISION. *Madura.*							
(83.) New Sepoy Lines in the town of Madura.		Commenced in 1847		6,090	6,090	Completed in 1848	It was deemed advisable to substitute for the thatched huts formerly occupied by the detachment of Native Infantry at Madura, a superior description of house with tiled roof and yard in rear, to be in keeping with other parts of the town, also for the prevention of fires, which were of common occurrence. The new lines have a very neat appearance, and are exceedingly airy and healthy.
(84.) Improvement of the drainage of the town of Madura.		Commenced in 1848		2,586			The drains are constructed of old fort stones (granite), backed and covered with brick in chunam.
(85.) Improvement of road to, and construction of a bridge over the Oopaur River on Road No. 5.		Commenced 1846–47.			2,903		The bridge is of three arches; centre arch 15 feet, and side arches each 12 feet.
(86.) Bridge across the Head of Thiroopoovanum Channel.		Commenced 1846			2,315		This bridge is of three arches, but was not quite completed.
(87.) Repairs to Road No. 2, between Dindigul and Pulney.				6,492	6,519	Completed in 1849	The repairs provided for in the estimate, are confined principally to 4¾ miles of black cotton soil, between the villages of Chuttraputty and Cannacumputty. The road is put in very good order.
(88.) Panlaur River Wagganies.	With a view of straightening the course of the stream, and thereby preserving the topes and cultivation on the right bank of the Panlaur from injury during high freshes.	Commenced in 1847		1,930	—		

(89.) Restoration of the Coonor Annicut.	For restoring the annicut to an efficient state.	Commenced in 1847	1,975	2,050 8	Completed	The cultivation under this annicut had fallen off to a considerable extent for want of sufficient water, the body of the annicut being in a leaky state, and the head of the channel too confined. The materials and workmanship were of good quality.
(90.) Rebuilding Causeway across the Vigay River.		Length, 1,095 feet	1,173 15			The method pursued has been to place three lines of stone endwise, to serve as retaining walls to the pavement, and prevent the stand being removed from under it; the spaces filled up with rubble in cement.
(91.) Supplying channel of Vaddakurray Tank from the Pereanai on the Vigay River.		Commenced in 1849	1,726			The estimate provided for raising and widening the right bank and for repairing six sluices of irrigation in the same, besides sundry other items for masonry work.
(92.) Cotton Gin-house at Shevacausee, in the Santoor Talook.	To accommodate two (2) 60 saw-gins worked by cattle, and three (3) hand-gins.		2,685	2,699	Completed	The materials and workmanship were favourably reported on.
(93.) Bridge across Nully Oday, on the high road from Madras to Quilon.		Commenced in 1846	2,987	4,691	Completed in 1848	The bridge is of three arches of 30 feet span each, and its construction has been of great service to the traffic of the district, particularly to the cotton bandies.
(94.) Floorings to six of the arches of the Ambasamooduram bridge across the Tambrapoorney river.			1,222	1,295	Completed in 1848	The dip or versed sine of the flooring is three feet, and the span of the arches 45½ feet. The work was carried into effect in a satisfactory manner.
(95.) Repairing high road No. 4, from Madras to Quilon, in the Ootapadarum Talook.		Commenced in 1848	5,311	5,311	Completed in 1849	The natural soil of the road is "black cotton." The principle of construction is, first, to raise the road half a yard or more above the level of the country with soil from the side trenches, and to place thereon a foundation of broken stones nine inches in thickness, and over them a coating of gravel of the same thickness. This plan is found to answer well.
(96.) Reconstruction of the Thimmarajasamoodrum Cooteecaul annicut across the Monneemoolaur.	Its reconstruction appeared likely to be less expensive in the long run than partial repairs.		2,486	2,538	Completed	The body of this annicut was in a very leaky state, and the foundations undermined. The foundations were of brick in chunam laid on rock, at the depth of 2¾ yards, and the body of the annicut above of the same material, faced with cut stone.
(97.) Restoration of the Thirtangul Pereacolum, in Santoor Talook.			1,427	1,525	Completed 1847-48	The tank bund has been raised, and a breach closed at the south end by a wall of rough stones in chunam. Since the repairs, the tank has been yielding a revenue to Government.
(98.) Repair of the Thentherapairee Head Sluice, in Streevigoontum Talook.			2,709	2,709	Completed; date not given.	This work serves to supply water from the Tamtrapoor River to 1,070 cotays of land, yielding a revenue of 23,031 rupees annually. The foundations are of brick in chunam, laid at the depth of nine feet on stiff clay.
(99.) Nenmany annicut channel and tank in Santoor Talook.			1,070	1,272	Completed; date not given.	The annicut was breached by freshes in 1847, to close which effectually it was necessary to extend the annicut for a distance of 44 yards, and to connect it by a wing-wall with the head of the channel; a further portion of 16 yards required to be raised, also the channel and tank banks and revetments required raising. The body of the annicut is of rough stone in chunam, floored on top with brick in chunam.

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No. 9.—PARTICULARS of some of the more Important of the Works executed under the Madras Civil Engineers' Department in the Years 1848 and 1849, &c.—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
EIGHTH DIVISION—*continued.*							
Madura—continued.				*Rs. a. p.*	*Rs. a. p.*		
(100.) Cunnadien Channel, from an annicut across the Tambrapoorny, in Shairmadevy Talook.	- - - - - -	- - - -	- - - -	2,135 - -	2,231 - -	Completed - -	- - The banks were raised, and the bed of the channel cleared, several sluices repaired, &c. The channel is one of the most, if not the most valuable work in Tinnevelly, yielding nearly two lacs of rupees annually to Government.
(101.) Tinnevelly Channel, from the Sootamullay Annicut, across the Tambrapoorny.	- - With the view to the preservation of existing revenue, which, in Fusly 1258, amounted to 63,942 rupees.	- - - -	- - - -	1,118 - -	1,123 - -	Completed, 1848 -	The repairs were similar to the above.
Tinnevelly:							
(102.) New Sea Custom-house and Master Attendant's Office, at Teutacorin.	- - The former Sea Custom-house having been found insufficient for the wants of the port of Teutacorin.	- - - -	- - - -	2,338 - -	2,339 - -	Completed - -	- - The former Sea Custom-house having been found insufficient for the wants of the port of Teutacorin, has been transferred to the post-office department. The master attendant's office and the customs and salt department are under one roof, with verandahs front and rear. The material is sandstone in chunam.
(103.) Talook Revenue and Police Cutcherry, in Streevigoontum.	- - The want of a good cutcherry at Streevigoontum was very much felt.	- - - -	- - - -	2,521 - -	2,782 - -	Completed - -	- - Constructed throughout of burnt brick in chunam, with tiled roof, in the form of a parallelogram; length, outside, 91 ½ feet, and breadth, 53 feet; contains one room for Tamil and another for Hindoovee records, with a room for prisoners under examination. The treasury room is a separate building, in the centre of the inner court, with flat terraced roof, and iron-barred door.
(104.) Repairs on the high road from Madras to Quilon, in several Talooks.	- - - - - -	- - - -	- - - -	- - - -	1,704 - - 7,786 - - 5,868 - -	- - - -	- - The estimates provided for constructing pavements, open drains, and tunnels. Their construction has been of great service to the traffic on lines, of which a part has been made available thereby for wheeled conveyances during the rains.
(105.) Mailacul Channel, from the Murdoor Annicut, on the Tambrapoorny River.	- - - - - -	- - - -	- - - -	1,946 - -	- - - -	- - - -	- - This is one of the most important irrigating channels in the Tinnevelly district, the annual revenue derived from it being about 1 ¼ lacs of rupees. The breadth of this channel was insufficient; the first 4 miles 4 furlongs and 170 yards of the channel's course had been widened to an average breadth of 14 yards, and the bed cleared of rock.
(106.) Paupancaul Channel, from the Carapanuddee.	- - - - - -	- - - -	- - - -	1,017 - -	1,156 - -	Completed - -	- - The bed of this channel has been widened, and cleared of rocks and deposit. The numerous tanks dependent on it have been rendered more effective, especially the large tank of Veersakamanee, in the Sunkermnarcovil Talook, the crops under which frequently suffered from drought, owing to the bad state of the channel.

No. 10.

A STATEMENT of Expenditure on Works of Irrigation, Roads, Bridges, and Ghauts in the Collectorates under the Presidency of Fort St. George, for the years ending 1838 to 1847 inclusive, will be found at Page 166 of the Printed Parliamentary Paper of the Honourable the House of Commons, No. 622 of 1851, the total amount being 82,51,187 rupees.

The expenditure in the Civil Engineer's Department, and by that of the Superintendent of Roads, for the years 1848 and 1849, was as follows:

YEAR.	BY CIVIL ENGINEER'S DEPARTMENT.	BY DEPARTMENT OF SUPERINTENDENT OF ROADS.	TOTAL.
	Rs.	*Rs.*	*Rs.*
1848 - - - -	* 13,17,192	1,54,627	14,71,819
1849 - - - -	* 9,94,603	2,57,519	12,52,122

* Exclusive of expenditure on the Godavery Annicut

In a Report from the Board of Revenue, in the Department of Public Works, the total disbursement during the year 1850, on Public Works is shown to have been

Fort St. George Public Works Letter, 18 May (No. 2) 1853.

YEAR.	FOR WORKS OF IRRIGATION.	FOR BUILDINGS.	FOR ROADS.	FOR TRUNK ROADS.	TOTAL.
	Rs.	*Rs.*	*Rs.*	*Rs.*	*Rs.*
1850 - -	9,60,960	1,05,516	1,62,165	3,52,523	15,81,165

	Rs.
Total Expenditure for the year 1838 to 1847 inclusive - -	82,51,187
„ „ 1848 „ - -	14,71,819
„ „ 1849 „ - -	12,52,122
„ „ 1850 „ - -	15,81,165
Total Expenditure for the year 1838 to 1850 inclusive - *Rs.*	1,25,56,293

PRESIDENCY OF BOMBAY.

No. 11.

Formation of the Road and Tank Department at Bombay.

In 1836, the Government of Bombay represented to the Court the bad state of the roads at that Presidency; that the tanks and bunds also were under no effective supervision, and reported that they had instituted the Department of Roads and Tanks, which measure was approved of by the Honourable the Court of Directors in 1837, as will be seen from the following extract from their despatch to the Government of Bombay, dated the 2d of June in that year.

Answer to Letters dated 28th February (No. 6) 1836, and 18th March (No. 10) 1836.

Reporting the adoption of a new system for the improvement of the roads, tanks, and bunds of the Presidency, and various measures commenced or proposed.

Although these measures were not altogether approved of by the Bengal Government, the Court's sanction is nevertheless requested, as they will prove of immense benefit to the inhabitants, and greatly increase the revenue. The construction of a causeway to connect Salsette with the Continent, at an estimated expense of 20,000 rupees, is also earnestly recommended for the Court's sanction.

Para. 8. "The bad state of the principal roads in your Presidency is attributed to the absence of systematic supervision, and to the employment of many persons on the same line, who are frequently without knowledge of road making, and have not time to look after the portion under their charge. The tanks and bunds are also stated to have been under no effectual supervision.

9. "The measures recently adopted to remedy these defects, consist of the appointment of one engineer officer as superintendent of roads and tanks in the Concan, Poonah and Ahmednuggur collectorates, to act in concurrence with the Collectors of Poonah, Ahmednuggur and the Concan, having under him two junior engineer officers, as assistants in each collectorate; and you propose eventually to place other districts under similar superintendence. There will, as you state, be some increase of expense occasioned by this plan, but no additional appointments will be required; the officers employed will not be diverted from their usual duties, their operations will merely become more systematic and combined."

2. Under date the 10th August 1836, the superintendent of roads submitted his first progress report under the new system, with a short description of the roads of the Presidency, from which it appeared, that there existed 449 miles of old roads, the repair of 211 miles only of which had been provided for, at a sanctioned charge of 36,449 rupees per annum. The only metalled road was that from Poona to Panwell (88 miles), being the only made road up the ghauts between the Tull Ghaut on the north and the Parr Ghaut on the south, both of which are nearly 100 miles distant, and both exceedingly difficult, indeed almost impassable for laden carts; so that all the wheel traffic from the Deccan might be said to be dependent on this line. In continuation of this line to the northern stations was the road to Ahmednuggur, but this had never been constructed on any regular system, cheaply patched in parts, and expensively though imperfectly built in others, partly under civilians, partly under contract, partly under engineers. The next in importance was the Great Northern Road, leading by Tannah and Bhewndy to Nassick; this "was constructed several years ago, but the line chosen presents so many difficulties, in the want of forage and water, and the extraordinary steepness of its ascents and descents, sometimes exceeding one in four, that it has become absolutely necessary for the furtherance of trade to improve the old, or construct a new route for the introduction of carts."

Tanks. Of the old tanks, it was stated in 1836, "few are now in use for the purposes of irrigation, * * * they are choked with the yearly accumulation of mud; one, however (the Paste), has to be partially cleared out for the purpose of affording drinking water; and one (the Goreygaum) has been thoroughly cleared, and its sides built up to the height of several feet."

Bundaras. On the subject of bundaras, it was stated, that "in the Ahmednuggur collectorate, particularly towards Nassick, every stream appears to have been most carefully husbanded in former days, not by damming it up in large sheets of water, but by merely throwing low walls across them, at distances of three or four miles asunder, and diverting the channel into watercourses for the purposes of irrigation after the close of the rainy season; of these bundaras many are in ruins, and very few complete."

On the receipt of the annual report for 1846–47, Sir G. Clerk recorded a minute concurred in by the Commander-in-Chief, proposing to abolish the Department of Roads and Tanks, and by incorporating its members with the Military Engineer Establishment, to provide a concentrated and general system of supervision and control over the entire Department of Public Works. The plan proposed to provide each district with a superior professional executive officer, in whom should be vested exclusively (subject to the general control of the superintending engineer of the division) the duty of originating and personally planning all public works of importance, he alone being responsible for their proper execution, his subordinates being merely required to work out the details under his instructions.

Sir George Clerk did not, however, remain long enough in India to carry out the scheme, and the Government of Lord Falkland deferred the proposed reforms until the Court's sentiments thereon had been declared. The Court's instructions were communicated to the Government of India in their despatch,* dated the 30th January (No. 2) of 1850.

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* *See* printed Parliamentary Return of the Honourable the House of Commons, No. 622 of 1851, pp. 149, 150, and 153.

No. 12.

TABULAR STATEMENT of the PRINCIPAL WORKS executed by the BOMBAY ROAD and TANK DEPARTMENT, from 1836 to 1850–51 inclusive, and by the BOMBAY ENGINEERS in the Civil Branch of Public Works, from 1846–47 to 1850–51 inclusive.

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
				Rs. a. p.	*Rs. a. p.*		
Ahmednugger to Seeroor - -	- - - - - - -	Length, 16 miles -	Seeroor - - -	- - Executed by convict labour.	- - - -	- - Formed prior to the year 1840.	- - This line was excellently completed in two seasons, under the superintendence of the Road and Tank Department.
Ahmednugger to Malligaum -	- - - - - - -	Length, about 10 miles	Malligaum - -	- - Executed by convict labour.	- - - -	- - Finished in 1839, with the exception of drains and bridges, but including a very difficult and extended ghaut.	- - Constructed under the superintendence of the Road and Tank Department.
Akoordie New Road and Junction Lines.	- - The Ounde and Panowlie and Bhojapoor lines will be abandoned on the completion of the Akoordie road, and the saving in repairs will amount to no less than 4,800 rupees per annum.	- - Length, 8 ½ miles; sanctioned 25th November 1847.	- - - -	- - Executed under contract.	*Rs.* For Roadway, 18,432 For Bridges and Nullahs } 28,426 *Rs.* 46,858 Or, 5,512 rupees per mile.	- - - -	- - The rate of cost of this road may be accounted moderate for a metalled and perfect road in the Deccan, considering that the country is almost always either undulating and intersected by numerous watercourses, or else composed of black soil, where the foundations of a road are an unavoidably expensive item. This road, commencing at the Dapooree Bridge, was stated to be in very good repair in December 1849, but the traffic increasing, it became dreadfully broken up during the hot weather, and it has subsequently been put into good order. In 1851 an expenditure of 8,038 rupees was sanctioned for increasing the width of the road from 20 to 25 feet, in consequence of the increase of carriage and cotton cart traffic.
Agra and Bombay Road - -	- - *See* paras. 13 to 17 and 66 of Court's Despatch to the Government of India, dated 30 January (No. 2) 1850, at pages 147, 148 and 153 of the printed Paper of the Honourable House of Commons, No. 622 of 1851.						
The Wakee Nullah Bridge, No. 1.	- - - - - - -	Commenced 1845–46	- - - -	3,744 5 6	- - - -	Completed 1846–47 -	- - This bridge consists of a semi-elliptical rubble masonry arch, 30 feet span and 8 feet rise, with two side semi-circular arches of 5 feet span each. The work throughout is constructed of rubble masonry, on a pitched foundation of the same; the breadth of roadway between the parapets is 18 feet; the roadway is embanked on the north side 250 feet in length, and on the south side 450 feet, at an average height of 5½ or 6 feet. The parapet is 3¼ feet high, and the length of parapet from end to end, 71 feet. The top is coped with chunam plaster.

(*continued*)

No. 12.—Tabular Statement of the Principal Works executed by the Bombay Road and Tank Department, from 1836 to 1850–51 inclusive, and by the Bombay Engineers, &c.—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
Agra and Bombay Road—*continued.*				*Rs. a. p.*	*Rs. a. p.*		
The Wakee Nullah Bridge, No. 2.	- - - - - - -	- - - -	- - - -	4,120 - -	- - - -	Completed 1846-47 -	- - This bridge is composed of two wooden trusses, each 54 feet in length, firmly fixed in rubble masonry abutments. The road being laid on the lower beams of the trusses, it has a water-way of 46 feet in the clear, the road crossing the nullah somewhat obliquely. The trusses are composed of pieces of teak, none exceeding 10 feet in length, taken out of the ruins of the fort of Malligaum. The embankment on the south approach is about 530 feet, filled in to an average height of 6½ feet; that on the north approach is 500 feet.
Walwarree Nullah Bridge	- - - - - -	Commenced 1845-46	- - - -	3,004 10 8	- - - -	- - Completed season 1846-47.	- - This bridge is composed of two semi-elliptical arches of 13 feet span each, and 6 feet rise. The breadth of the roadway between the parapets is 18 feet, and length of parapet, from end to end, 60 feet. The roadway is 22 feet broad, and embanked on the north side of the bridge 420 feet in length, and on the south side 530 feet, and an average height of 5½ feet. The work throughout is constructed on a pitched foundation of an uncoursed rubble masonry to a depth of 4 feet.
Kussara to Kurdee, proposed New Line.	To supersede the old line of road	- - Sanctioned 18th March 1849.	Kurdee - - -	- - - -	1,33,391 - -	- - - -	- - The new line only deviates from the old one where the dips are at present too steep for traffic, and no slope is to exceed 1 in 19.
Bridge over the Pharasherry River.	- - The post was occasionally delayed as much as eight hours.	- - - -	At Pimpulgaom.	—			
Agra Road, between Scindwal Fort and the River Nerbudda, through the Nimar Territory.	- - Converting it into a fair-weather road.	- - Length, 43 miles; commenced 1849.	Nerbudda River -	3,705 13 3	- - - -	Completed 1850 -	- - The nature of the work is the removal of obstructions, the cutting of side drains, and the sloping the approaches into rivers and nullahs. This has been an useful piece of work. The amount here expended is said to be required to be spent annually on this piece of road, to make it a clearly marked fair-weather road during the proper season.
Akheira: Repairing Bhundarrah and Watercourse.	- - - - - - -	- - - -	- - - -	1,183 8 7	- - - -	Completed 1849 -	- - It was satisfactorily completed shortly after the commencement of the past official year.

Bombay, *vid* Tannah and Bhewndy, to Nassick, *vid* Tully Ghaut, on the Great Northern Road.	- - For the furtherance of trade with Candeish.	- Length, Bombay to Bhewndy, 33 miles; Bhewndy to Nassick, 78 miles. This road was constructed previously to 1836, and provision made for annual repairs.	Nassick - - -	Not known - -	Not known - -	Not known - -	- - The line chosen presented so many difficulties, in the want of forage and water, and from the extraordinary steepness of its ascents and descents, sometimes exceeding one in four, that a new route was ordered to be surveyed in 1836.
Bombay: Continuation from Nassick to Chandore.	- - Ditto - - ditto - -	- - Length, 40 miles, which completes the line as far as the Candeish Collectorate. Sanctioned season 1835-36.	Chandore - -	- - - *See* Nassick and Chandore Road, Letter N.			—
Bassein: Construction of the Gerridge Bund.	- - For the recovery of land from the sea.	- - - -	- - In the neighbourhood of Bassein.	- - - -	- - Two estimates, *Rs.* 9,354. 12. 8.	- - - -	- - In 1841 the Superintendent reported that the estimates would be considerably exceeded before the works could be completed, if, with reference to the violent ebbing and flowing of the tide, that end could ever be accomplished. Report of 1839, page 19. Letter 61, of 1840.
Bassein: Construction of the Kullum Bund.	- - Ditto - - ditto - -	- - Sanctioned 15th February 1838.	- - ditto - -	- - - -	9,122 11 -	- - Completion not reported.	—
Bhore Ghaut Road - - -	- - - - - - - -	- - - -	- - - -	- - - -	- - -	- - - -	- - This road runs in a single line as far as Poona, where it receives, as in a centre, the diverging lines from Ahmednugger, Sholapore, and the Neera Bridge, the prolongation of which extends the communication to the centre of the Peninsula.
Bombay: The Bombay Pier; the Tannah Causeway and Bridge; the road from Trombay to Chimboor; the Chimboor Causeway, and the junction of this work with the causeway at Sion.	- - Connecting the former islands of Bombay, Salsette and Trombay into one, and these again with the main continent of India.	- - - -	- - These works are all within 23 miles of the capital.	- - These works were undertaken by convict labour, and are all of such a costly and extensive description that it was considered that they could not possibly have been undertaken by other means.	- - - -	- - Completion of the Chimboor Causeway, and of the Trombay and Chimboor Road, reported in season 1840-41.	- - These works open two more lines of ingress for the traffic of the port, which owing to its chief export (cotton), and the one particular season at which it all crowds into the harbour, are particularly wanted, giving a very greatly increased value to all property in the island of Trombay, and leading to the reclaiming of many thousands of acres of ground from the sea.
Bhadne, repairing the Bundarrah and Watercourse of.	For irrigation - - - -	Season 1847-48 -	Bhadne - - -	*Rs.* 2,993. 1. 11.	- - - -	- - Completed season 1849.	- - The work was completed satisfactorily shortly after the commencement of the official year.
Bazar, Peera, Sattara: constructing a tunnel at.	- - To connect the town of Sattara with the valley of the Oomooree River, a high ridge having previously interposed an effectual barrier to communication between them without a long detour.	Length, 192 feet -	Oomooree Valley -	- - - -	- - *Rs.* 31,500. 14. 9., of which *Rs.* 13,709. 14. 9. were to be subscribed by the natives.	- - - -	- - This tunnel was completely driven through the range joining Enteshwar and the port of Sattara into the Oomooree valley, in January last. Length, 192 feet; breadth at base, 30 feet; at top, 24 feet; height from bottom to roof, 24 feet.

(*continued*)

No. 12.—Tabular Statement of the Principal Works executed by the Bombay Road and Tank Department, from 1836 to 1850–51 inclusive, and by the Bombay Engineers, &c.—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
				Rs. a. p.	*Rs. a. p.*		
Chandore Ghaut Road		Length, 5 miles; was laid out, and provision made for annual repairs, previously to the formation of the Road and Tank Department in 1836.		8,069			This ghaut into the plain of Candeish had a descent of 1 in 5 and a third, but the worst portion is only about 500 feet in length. In November 1841 the Government ordered the slope of this ghaut to be reduced to 1 in 18. This ghaut has been passable for carriages since May 1843.
Chowk on the Great Northern Road to Callian, to be continued to join the Thull Ghaut Road.	This road will open up some of the most productive districts in the Northern Concan.	Season 1838–39	Callian	33 miles finished to 1840–41, at an expense of 22,191 rupees.			This line, when finished, with the exception of a few miles between Perm and Nagota, for which sanction is anticipated, will open a line of road through the Northern Concan, from Mahabaleshwar to the Thull Ghaut.
Chiploon, in the Southern Concan, over the Koombarlee Ghaut.	With the view of facilitating intercourse and traffic.	Length, 17 miles; season 1838–39.		3,340 7 3	This line was originally constructed at a considerable cost, but for many years was left without any repairs; a supplementary estimate of 3,112 rupees was passed in 1844–45.		This line was, for the most part, obliterated, and required to be constructed "de novo."
Cooly Bridge, repairs of the	To facilitate communication	Sanctioned 26th December 1845.	Situated on the west of the town of Bapein.	569	569	Completed season 1845–46.	—
Carringa: Construction of a Mamlutdar's Cutcherry.		Sanctioned 30th April 1847.	At Oorun		1,367 rupees by contract.	—	
Chowndanah Bundarrah, improvements to the.	For irrigation	Sanctioned 1845–46	Chowndanah	1,503 9 9		Completed season, 1848–49.	A large body of water now occupies the place of a mass of sand and deposit, previously choking up the rear of the bundarrah wall, and the supply of water has enabled the villagers to bring under wet cultivation land previously yielding monsoon crops only.
Cunnassee Watercourse, improvements to the.	For purposes of irrigation	Sanctioned 1848–49	Cunnassee	4,961		Completed 1849	On the 22d of July, and on the 4th October 1849, the parapets of the aqueducts were injured by floods, owing to the steep slopes to the sides of the cutting of the watercourse.
Churrygaum Khind, constructing a road over the.		Sanctioned in March 1850.	Churrygaum	3,168 3 2	4,000	—	

Chineh Khind, constructing a Bullock Track over the.	- - - - - - -	Length about 2½ miles	- - - -	- - - -	7,146 - -	- - - -	- - This khind is situated on the direct line of road between Neera and Waee; and a line was marked out with a slope of 1 in 21, the line being about 2½ miles in length: for the greater part, the cuttings being through solid rock.
Dapoorie and Holkar Bridge Junction Road.	- - To perfect the communication between Bombay and Nuggur, when the Bhogapoor line shall have been abandoned.	- - Sanctioned 25th November 1847.	- - - - -	- - - -	- - Under contract for 6,350 rupees.	- - - -	- - It is believed that during the fair season the greater portion of the traffic between these places will proceed by Poona and Kurradee.
Dabaree Patna Bundarrah, improvement of the.	- - For a supply of water to the villagers.	Sanctioned in 1847–48	- On the Girna River bank.	3,712 9 11	- - - -	Completed 1848–49 -	- - The monsoon of 1848 did not injure this work, but the shifting of the deposit in rear of this bundarrah, consequent on the construction of four sluices on the left bank, and the prolongation of the wall on the right bank, had not given satisfaction to the villagers of Dhabaree and Patna, on the opposite banks of the river, who were constantly quarrelling about the supply of water. It is remarked by the Superintendent of Roads and Tanks, "in a river having low banks, like the Girna River, at the point where this bundarrah is constructed, it does not appear possible to modify an old existing bundarrah so as to supply water in the required proportions to land on both sides of the river; all that can be done is to render the bundarrah and watercourses so efficient that there may be as little loss as possible of the water supplied by the river, leaving it to the villagers, under the superintendence of the proper revenue authorities, to divide the water proportionally to their requirements on either side of the river."
Ghorabunder, New Pier at, and Causeway between Bendora and Muhim.	- - To enable the traffic from Surat to reach Bombay by the direct route of the Muhim Causeway, without incurring the delay often attendant upon the navigation around the southern extremity of the island.	- - - -	- - - -	- - - -	84,239 9 3	- - - -	- - All intention of building the new wharf was abandoned, for the time, in 1845–46, in consequence of the traffic being considered too slight to warrant the extensive outlay.
Ghoreygaum Tank, reconstruction of.	- - To afford supplies of water to travellers.	- Commenced in season 1835–36.	- - In the Northern Concan.	5,958 3 4 of which sum 3,000 rupees were subscribed by the inhabitants.	- - - -	- - Completed, season 1836–37.	- - This work was undertaken on petition of the inhabitants.
Gokhirwa Bridge, repair of the	- - Connects the island of Bassein with the main land.	- Sanctioned 31st March 1846.	- - - -	- - - -	- - - 5,702 Supplementary Estimate - 976 *Rs.* 6,678	- - - -	- - This bridge was represented to be much required on account of its being on the high road from Bassein to Bhewndy, and in the neighbourhood of extensive salt pans, the produce of which is conveyed over it into the interior of the country; the supplementary estimate was rendered necessary from the timbers of the old bridge being in so bad a state as to preclude the possibility of their being used to the extent allowed for; the progress of the work was likewise much retarded by the tides by which, at the springs, the piers and abutments were covered for several days.

(*continued*)

No. 12.—Tabular Statement of the Principal Works executed by the Bombay Road and Tank Department, from 1836 to 1850–51 inclusive, and by the Bombay Engineers, &c.—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
				Rs. a. p.	*Rs. a. p.*		
Jhorgah and Nusseerabad, completing the road between.	- - - - - - -	- - Length, 63 miles; sanctioned season 1847–48.	Nusseerabad - -	15,151 – 4	- - - -	Completed 1849–50 -	- - The sum of *Rs.* 172. 15. 6. out of the total cost was incurred for repairs to the embankments and roadways of the bridges, in consequence of the country people having cut them up with their carts before the earthwork had had time to consolidate. It runs somewhat parallel to the Boree and Geerna Rivers.
Kesseylee Bunder - - -	- - - - - - - -	- - Completed prior to 1840.	Kesseylee - -	- - Actual cost of materials, and all the labour executed by convicts in 1839, *Rs.* 10,904. –. 6.	- - By free labour, *Rs.* 45,653. 12.	- - Completed prior to 1840.	—
Kessoordee Tank, in the Poonah Collectorate.	For irrigation - - - -	- - Estimated in season 1835–36. Length about 1,409 feet, of which 139 feet are solid masonry, 1,170 feet earthen embankment, and 100 feet excavation, for an escape channel for floods.	- - Within 24 miles of Poona.	11,824 – –	- - Two estimates, *Rs.* 7,045. 3. 11., and *Rs.* 9,043. 11. 1.	Completed in 1837 -	- - Lying across the gorge of a long valley, and to form, when completed, a sheet of water, below which there are upwards of 1,900 acres of fine land lying waste, which by the agreements taken from the natives will be brought under cultivation. The greatest depth of water, when full, will be 38 feet, the greatest breadth nearly half a mile, and the greatest length nearly three-quarters of a mile; this work failed during season 1843–44, from the water rising above the top of the embankment, which was of earth, and carrying away a great portion of it; it is remarked, by the Superintendent of Roads and Tanks, "results such as these, from works designed by officers of acknowledged talent, must impress extreme caution in all future projects of the kind, and I think it will be found that the most profitable method of extending irrigation will be, in the first place, to restore the boundaries which formerly existed in the richer districts, and gradually to extend this system as far as appears practicable, instead of attempting to form immense reservoirs of water in less productive parts of the country."
Khandalla Tank, additions to -	- - To render it efficient and complete for the supply of water to travellers.	Sanctioned in 1845 -	Khandalla - -	1,421 – –	- - - -	Completed in 1845–46	- - The retaining wall has been raised to an uniform height, and a coping added of three feet broad; coping stones of angular formation have also been affixed to the tops of the well walls, so as to prevent people washing in the water they contain.
Kesseylee: Protection of the village of Kurrud from inundation.	- - The village had been endangered by encroachments of the Kurra River.	Sanctioned May 1845	Village of Kurrud -	- - - -	715 – –	- - - -	- - The villagers consented to be assessed for the sum of 200 rupees.
Kirkee: Construction of a piece of road.	- - For shortening the communication between the hospital and burial-ground.	- - Length about 3,000 feet.	At Kirkee - -	- - To be constructed under a contract of 1,920 rupees.	- - - -	- - - -	- - In the event of the junction between the new line by Akoordie and the Nuggur Road being effected across the Dapoorie and Holkar bridges, the newly constructed piece now reported on will also form part of the connecting line.

Korgaon: Construction of a foot suspension bridge over the Wyturnee River.	A bridge has long been required, the river being of a remarkably peculiar section, very confined in breadth, and extremely deep.	Sanctioned season 1844-45.	Korgaon		951		The amount is probably higher than it may be deemed expedient to lay out on a work off any of the main lines, and for the use of foot passengers only; but no bridge could be built in the locality for less amount.
Khandalla: Erection of a small tiled building.	For the purposes of a post-office.	Sanctioned season 1845-46.	Khandalla	286	256	Completed season 1845-46.	The outlay exceeded the estimate by 30 rupees, chiefly in consequence of teak having been used instead of junglewood in the construction of the doors and windows.
Karlee, on the Panwell and Poona Mail Road: construction of new works.	For a travellers' bungalow, and a public well.	Sanctioned season 1845-46.	Karlee	For bungalow, 2,289 rupees; for well, 770 rupees.		Completed season 1845-46.	The bungalow was entirely new, and includes out-houses; the well is a complete construction of cut stone masonry.
Kundanah Bundarrah, improvements to the.	For irrigation	Sanctioned 1847-48	Kundanah	1,139 - 1		Completed season 1848-49.	This outlay has been lost to Government, as it appears that no water occupies the place of previously accumulated deposit, or at least in quantities too trifling to be of any service; it would have been difficult, if not impossible, to have anticipated such a failure.
Khutghur Watercourse, improvements to the.			In Candeish	1,226 7		Completed season 1848-49.	—
Morai Bunder to Carangah		Length, five miles					This line existed previously to the formation of the Road and Tank Department in 1836, but no regular provision had been made for annual repairs.
Mulligaum and Surat Road		Made by the Pioneer Corps, 1823 or 1824.					This line never appears to have received any regular repairs; the largest ghaut on the line is the Koondaibharree Ghaut, between Dhywell and Beersurwarree, the slopes of which are in some parts 1 in 5.
Mhar: Clearing out of the Chowdar Tank.	For supply of water	Commenced season 1845-46.	Chowdar	4,433	6,407	Completed season 1846-47.	The mud in the bed of the tank was found, after the water was drawn off, to be but 4 ½ feet in depth, instead of 5 ½ feet, as had been estimated for; the balance was to be expended in repairing portions of the retaining wall.
Moodee Bundarrah, improvement to the.	For supply of water	Commenced season 1846-47.	In Candeish	2,903 5 9	2,628 5 9	Completed season 1848-49.	The excess of expenditure was occasioned by modifications of the original plan.
Mumdapoor Tank, prolongation of the retaining wall to the.	To strengthen it	Length, 639 feet	In Sattara		8,540		This will complete the retaining wall to a length of 639 feet, averaging from 6 to 43 feet high, and with the other repairs tend to the preservation of this old Mohamedan work.
Nagitora to Mahbleshwar Road		Length, 71 miles; this line of road existed previous to the formation of the Road and Tank Department in 1836, but no provision had been made for annual repairs.		5,325			In season 1842-43 it was reported that a contract had been entered into for keeping this line in repair for 5,325 rupees annually, which plan had hitherto succeeded very well, as the road was reported to be in a much better state than in former years.

(continued)

No. 12.—Tabular Statement of the Principal Works executed by the Bombay Road and Tank Department, from 1836 to 1850–51 inclusive, and by the Bombay Engineers, &c.—*continued*.

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
				Rs. a. p.	*Rs. a. p.*		
Chowderaure Tank, at Mhar	- - - - - - -	- - Sanctioned season 1844–45.	- - - -	- - - -	- - 7,234 rupees, of which 2,000 rupees are to be defrayed by the inhabitants; the remainder by Government.	—	
Nassick to Chandore, on the Great Northern Road.	- - Undertaken in continuation of the road which already existed from Bombay to Nassick, to open the flourishing district of Candeish.	- - Length, 43 miles, 2 furlongs, 91 yards; commenced in season 1837–38.	- - - -	*Rs.*37,884. –. 10., viz. *Rs. a. p.* Road - 27,512 13 2 Bridges, 10,371 3 8 Average, per mile - 874 14 2	- - - -	Completed in 1839 -	- - This road, in connexion with the one constructing through Candeish, reaches from Bombay to the Sindwar Pass in the Sautpoora range, and forms the whole Bombay portion of the road to Agra, while the traffic of Berar flows into it by the line of Oomerawutty and Mulkapoor; in 1847 it was reported that it would be difficult to find a half mile in any portion of this line which could be justly characterised as in indifferent order.
Nassick and Sinnur Road	- - To connect the towns of Nassick and Sinnur.	- - - -	Sinnur - - -	- - Expended on the road, *Rs.* 15,832. 11. 11.	- - - -	- - - -	- - The portion between Sinnur and Sinda is by no means well laid out; no survey was made of this line before commencing it, as the country appeared to present little or no difficulty to the formation of a cleared road; the result has proved that even in the most easy cases it is impossible to produce any satisfactory road without going through all the preliminary details. The road was reported in 1844–45 to be in fair order; paved dips were ordered to be constructed across the four principal nullahs, as the traffic was not of sufficient importance to warrant the outlay for bridges.
Narrungaon: Repairs to a Bridge across a nullah, between Seroor and Soopah.	- - - - - - -	Erected in 1842 -	Narrungaon - -	- - - -	- - - -	- - - -	- - This bridge was designed by Major Peat; some deflexion is observable in the joists which will render supports necessary; this is ascribed to no fault in workmanship, but solely to deficiency in the scantling of the timber.
Poona to Panwell Road, *viâ* Dhapooree, with old Branch, *viâ* Cund and Panowlee.	For traffic over the ghauts -	- - Length, 88 miles; constructed, and provision made for annual repairs, previous to the formation of the Road and Tank Department in 1836.	Panwell - - -	Not known - -	Not known - -	- - This road was constructed previously to the formation of the Road and Tank Department in 1836.	- - This is the only made road up the ghauts between the Tull Ghaut on the north and the Parr Ghaut on the south, both of which are nearly one hundred miles (100 miles) distant, and both exceedingly difficult, and indeed almost impassable for laden carts, so that all the wheel traffic from the Deccan may be said to be dependent on this line (in 1839–40); the present ghaut in several places is still somewhat steep, being in some places about 1 in 10, which renders it necessary for carts to drag their wheels in descending. The toll returns of 1839–40 amounted to 18,629 rupees, and of 1840–41 to 27,741 rupees, being an increase of 9,112 rupees. On this line is the Dapooree bridge, 20 feet in breadth and 470 feet in length, with a raised approach on the right bank 540 feet in length; this bridge is of timber, with waterways of 35 feet, and the roadway supported by three trusses, each composed of a straining-beam and three struts; its completion was reported in season 1842–43, the cost having been *Rs.* 68,587. 15. 10.

Poonah to Ahmednuggur - -	-- In continuation of the Poona and Panwell lines to the northern stations.	*Miles.* Poona to Seroor, 44 Seroor to Ahmednuggur - 31 ½ Miles - - 75 ½ This line had been laid out previously to 1836, but no provision had been made for annual repairs.	Ahmednuggur - -	-- 30,161 rupees had been laid out on about 17 ½ miles of the road prior to 1836, but the total expenditure on the line is not known.	- - - -	-- By the employment of convict labour it was hoped that the completion of this line would be effected in season 1846–47, at a trifling cost to Government.	-- Partly to 1836 this line had been laid out and kept up, partly under civilians, partly under contract, and partly under engineers; the Shikrapore bridge was completed in season 1842–43, at an expenditure of *Rs.* 22,433. 2. 5.; the Muragaon bridge, which had been washed away, was rebuilt in season 1843–44, at a cost of 1,700 rupees; it has four waterways, 12 feet each.
Penn to Kussoolee Road, at the bottom of the Bore Ghaut.	-- Is expected to advance in an extraordinary degree the salt trade carried on from Penn with the interior of India, by introducing the use of carts instead of bullock commerce.	-- Length 17 ½; commenced in October 1836.	-- From Penn, in the Northern Concan, to Kussoolee, at the foot of the Bore Ghaut.	6,700 9 5	8,925 - -	-- Completed in June 1837.	—
Poona to Sholapoor - -	-- To open out the valuable Barsee cotton trade, and to insure communication for troops and guns with that military station during the rainy season.	-- Length, 149 miles; surveyed in season 1835–36.	- - - -	- - - -	1,27,805 8 6	- - - -	-- The portion of this road through the cantonment of Poona was specially, in 1845–46, repaired by contract, for 8,236 rupees; estimates were also prepared for extending this road for some distance towards Hunsesseer, crossing the Nulla which flows past the horse artillery lines by a bridge.
Patus and Indapoor Road -	-- Undertaken for the purpose of furnishing food and employment to the distressed population of the Bheemturry and Indapoor districts, who were represented to be suffering severely, in consequence of a succession of unfavourable seasons.	-- Length, 44 miles, 6 furlongs; sanctioned season 1845–46.	- - - -	-- 1,42,284 rupees expended to 1847, of which 1,23,208 rupees solely on labour and its superintendence.	- - - -	- - - -	-- The superintendence of this work was entrusted to Serjeant Overseer Armistead, whose constant and severe attacks of ill-health at the Thull Ghaut had incapacitated him from further employment in that neighbourhood, except at the risk of life; the number of people daily employed on the line averaged, in June 1846, six thousand four hundred and seventy (6,470); the workmanship on this line was reported in 1847 to be inferior to none in the Bombay Presidency.
Poona to the Neera Bridge -	- - - - - - -	-- Length, 40 miles 6 furlongs; this line was in existence previously to the formation of the Road and Tank Department in 1836, but no provision had been made for annual repairs.	- - - -	-- The expenditure of *Rs.* 2,075. 12 *a.* 10 *p.* was reported to season 1843–44.	- - - -	- - - -	-- (1839). The Bapdeo Ghaut, near Poona, is the great obstacle on this line, being almost impracticable for carts, and in some parts dangerous from want of parapet walls; the traffic on this ghaut, however, is stated (in 1847) not to be so important as to render the construction of a new ghaut advisable.
Poona to Narrangaum - -	- - - - - - -	-- Length, 45 miles 7 furlongs; this road existed previously to the formation of the Road and Tank Department in 1836, but no provision had been made for annual repairs.	Narrangaum - -	- - - -	- - - -	- - - -	-- In 1840–41 this road was represented to be in good repair, but as it crossed so many unbridged rivers, it was of little use during the monsoon, and could only be considered as a good-weather road; it will form a portion of the central line between Belgaum and Nassick.

(*continued*)

No. 12.—Tabular Statement of the Principal Works executed by the Bombay Road and Tank Department, from 1836 to 1850-51 inclusive, and by the Bombay Engineers, &c.—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
				Rs. a. p.	*Rs. a. p.*		
Panwell to Penn	For the accommodation of the salt trade.	-	-	148 9 -	-	-	Improvements were made to the Aptah Ghaut in season 1843–44, much to the convenience of the Bringarees, considerable numbers of whom proceed from Panwell to Penn, to take salt from the latter place.
Paste Tank, repairs to	For purposes of irrigation	Sanctioned, season 1835–36; length 1,680 feet; greatest breadth 125 feet, and greatest depth 9 feet.	At the village of Paste, in the Sinnur Pergunnah.	Cost to Government, 250 rupees, an equal amount having been given by the villagers in money, materials and labour.	-	Completed in season 1836–37.	This work, in addition to securing the former baghayet revenue of the village, is to return to Government an additional 30 per cent. on the capital expended.
Panwell Port to the Salt Panee of the island of Carranjah.	This road was undertaken by Government, not only with a view to its general usefulness, but also to furnish employment to the Kattywar emigrants.	Length, 40 miles 4 furlongs.	-	13,188 14 8	—		
Poona New Bridge	The old bridge has been removed, it having been in a very unsafe state.	Commenced on the 1st November 1845.	-	*Rs.* 29,564, of which *Rs.* 10,382 were subscribed by the inhabitants of the town.	Commenced by contract, under Lieutenant Cowper's superintendence, for 26,975 rupees.	Completed in December 1846.	This bridge was designed by Major Peat. The excess over the contract amount was expense allowed by Government for removing the centreings, &c. of the old bridge.
Panwell Bunder	Raising the platform on which the custom-house is situated, together with the reconstruction of masonry revetments.	Sanctioned 2 January 1846.	Panwell	5,725	Under contract for 5,725 rupees.	Completed season 1846–47.	—
Poona to Ahmednuggur Road	Estimates for constructing stone and foot bridges over the Hung Nullee for 21,704 rupees, and over the Seena River for 6,358 rupees, were submitted in 1843–44; a second flying bridge was constructed at Karringaon, at a cost of 990 rupees. Bridges were sanctioned on the 30th January 1846, over the Kondapoor and Nusudwady Nullahs, the streams of which had hitherto, at flood, invariably impeded the dawk. Both bridges to be built by contract, on designs by Major Peat; that over the Kondapoor Nullah for 6,995 rupees, that over the Nusudwady Nullah for 4,305 rupees.						
Poona and Wangoolie, new line of road.	To avoid the present circuitous route by Holkan's Bridge and Lowgaum, as far as traffic and communication between Poona and Nuggur are concerned.	—					

Rutnagherry Collectorate: Construction of road leading into Chiploon.	To perfect the communication between the town of Chiploon and the Koombarlee Ghaut.	Length, 3 miles; sanctioned season 1845–46.	Chiploon	2,700	Completed season 1845–46.	This cross road was very defective.
Rawere and Dhurungaum Road		Length, 54 miles				This is a fair-weather road, passing mostly over black soil; it crosses the Taptee and Geerna, both large rivers with very high banks.
Ratraz Tank, clearance and improvement of the.	The tank is for the supply of the inhabitants of Poona with water; the additional quantity of water which it was calculated would become available through the intended improvements, amounted to 30 days' supply.	Season 1846–47	Poona	46,765		The work to be performed includes the removal of 2,900,000 cubic feet of earth, also the re-opening of a channel, and repair of a bund, which had been originally constructed with the intention of carrying off all earthy matter, and preventing any deposit in the tank, but which had fallen into complete neglect and disuse.
Salsette, roads in the island of		40 miles of road existed previously to the formation of the Road and Tank Department in 1836, for the annual repairs of which provision had been made.	Salsette			These roads consist of 17 ½ miles of the Agra Road, between Sion Causeway and and Colsette Bunder, of 21 ½ miles between Bandora and Gherabunder and Sauksee, and an area of 5 ½ miles between Trombay and Sion Chowkie; their aggregate annual cost for repairs is 12,000 rupees, or 270 rupees per mile.
Salsette: Road connecting Sion with Trombay.	Opens up a fertile district in the vicinity of Trombay, to the Bombay market, and also affords facilities for the transit of the mail from Panwell during the monsoon.	Length of road, five miles.	Trombay		Completion reported in 1840–41.	This work was performed entirely by convict labour.
Salsette: Girridge Bund					Completed 1840–41, with the exception of the sluices.	The slope of this bund is 1 ½ to 1, with a surface of turf; whereas with such material, the inclination should have been as much as 5 to 1 to ensure stability.
Salsette: Construction of a bridge across a nullah near the 21st mile on the road to the Chimboor Causeway.	In lieu of an old wooden bridge reported to be in a dilapidated and ruinous state.	Sanctioned season 1844–45.		1,310		This bridge has masonry abutments and wooden superstructure.
Salsette: Proposed new bridge at Erla Parla.	In lieu of one which was represented by Sir Jamsetjee Jeejeebhoy to be inconveniently shaped and situated, so as to impede the increased traffic which the new causeway was calculated to attract; the old bridge had been built at right angles with the course of the stream, while the direction of the road is very oblique.	Sanctioned season 1845–46.	About five miles from Bandora.	5,224 of which Sir Jamsetjee Jeejeebhoy expressed his readiness to furnish 4,000 rupees.		The new work will be a skew bridge, consisting of two brick arches, of 20 feet span, with a stone pier and abutments.

(continued)

No. 12.—Tabular Statement of the Principal Works executed by the Bombay Road and Tank Department, from 1836 to 1850–51 inclusive, and by the Bombay Engineers, &c.—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
				Rs. a. p.	*Rs. a. p.*		
Shada: Repairs to a Bundarrah and Watercourse.	For irrigation	Season 1848–49	At the town of Shada, in Candeish.	683 3 5		Completed season 1848–49.	The repairs consisted of stopping a considerable leak in the rear of the bundarrah wall, by backing the wall with new masonry near the leaky point, and constructing four breast walls on the line of the watercourse.
Seerwarra: Repairs, &c. to the centre Bundarrah and Watercourses.	For irrigation purposes	Season 1848–49	In Candeish			Completed 1848–49	The works consisted of breaking two scouring sluices in the main bundarrah wall, building a screen wall with an arched opening at the mouth of the watercourse, and breaking a small open-headed scouring sluice below this screen wall. The parapets of an old aqueduct on the line of watercourse had to be renewed.
Seerusmeenee Bundarrah, constructing the.	For purposes of irrigation	Season 1847–48	In Candeish	9,647 12 2		Completed May 1849	It is the first bundarrah constructed entirely by the Engineer Department. The arrangement of the masonry work, &c. was much the same as in modifications of old existing bundarrahs, with the addition of a reservoir and sluice apparatus at the mouth of the watercourse. During the monsoon of 1849, the floods being unusually high, inflicted some slight injuries to the bed of the river and the pointing, but the work had borne the violence of the monsoon as well as could have been wished. The pointing was repaired and the excavation in the river begun to be filled in with dry stone work, protected by a "pukka" masonry apron above, and supported by a retaining wall.
Sattara and the Limb Khind: Road with continuation for 3 ½ miles.	This is a part of the Sattara and Waee Road, a direct Sattara and Poona Road.	Season 1850–51; length from Sattara to the Limb Khind four miles, beyond the Limb Khind 3 ½ miles.	Sattara	8,000	For the bridge over the Kodally River, 8,748 rupees.		Of the first portion of four miles, two were completed by the prisoners, the remaining two miles were made by Ballajee Punt Nathoo, inamdar of Panchwar, at his own expense; the second part has been bridged and drained, the inamdars of the Waee Valley giving 4,000 rupees, and Government another 4,000. A bridge across the Kodally River has also been sanctioned. The following serious obstacles on these lines have to be overcome: The Yenna River, the Khrisna River, the Kamalkee Ghaut, the Neera River, the Katriz Ghaut. Travellers' bungalows have been erected and finished at Punderpoor, Waugi, Poosasaolee, and Kurar; other bungalows are much required, and will be constructed.
Sattara, improvements in the town of.	The road in the Prutab Gunj Petta in the town was reported, in season 1850–51, to have been completed by the prisoners, with the aid of a few free labourers, and the following improvements to have been effected, viz., improvements in the market, including a line of road carried through it, joining the Sumvar and Prutab Gunj Peth roads: a large arched drain constructed on the southern approach to the tunnel; an approach lined out, and executed in the rough by the prisoners, from the town to the tunnel entrance, south side; this approach partly extended into the town by the Imaumpoora tank by the prisoners. A new line of road, 2,740 feet long, made, running at the back of the palace joining the Shukurwar Petta and the Genda Mall lines. A vegetable market formed out of the old engineers' stores, yielding a yearly rent of 375 rupees, and every stall rented and occupied.						

Tannah Causeway - - -	- - To unite the island of Salsette to the continent of India.	Suggested 1836–37 -	- - - - -	- - - - -	- - Original estimate, 20,000 rupees.	- - - - -	- - The work which is designated the Tannah Causeway, consists, strictly speaking, of but a couple of ramps, one on either bank of the estuary, which approach each other towards the centre of the stream, where there is a flooded interval of the natural bed of considerable length at ebb tide, and never less than five (5) feet deep. The greater portion of the ramps is consequently submersed at high water, and the guns, erected along the sides for the purpose of fastening vessels to, were complained of as causing, while thus invisible, much damage to the native craft; they were consequently removed in 1845–46, and mooring rings substituted.
Trombay Pier (*see* Bombay) -	- - - - - - -	Commenced in 1837 -	- - - - -	- - - - -	- - - - -	- - Completed season 1843–44.	—
Tull Ghaut Road: Survey and Improvement.	- - - - - - -	Length, 78 miles -	- - - - -	- - The sum of 1,16,783 rupees was expended on its construction; the balance, 21,723 rupees, was to be laid out in metalling the road; also an additional sum of 7,386 rupees, for further improvements, recommended by the committee appointed to examine the line.	1,38,506 - -	Completed in 1850 -	- - This road was carefully inspected by a committee of engineer officers, who reported that with reference to the amount expended on it, "the construction is very perfect."
Tull Ghaut: Experimental Line	- - - - - - -	- - Commenced December 1845. Length, 1½ miles.	- - - - -	70,256 - -	- - - - -	- - Completed 27th December 1847.	- - The construction of a masonry parapet, until the whole of the Ghaut should have been in other respects completed, was not originally contemplated; whereas, for unanswerable reasons, it has been judged advisable to proceed with the parapet simultaneously with the rest, and the consequence is, that a well-built wall, three feet in height, and 4,445 feet in length, had been completed up to 1845–46. It has been found that the entire distance requiring to be so defended is about 3 miles, 4 furlongs, and 24 yards. The unusually tardy progress of the works is stated to have been caused by several circumstances: first, the position of the work, far removed from any town, and in a remarkably thinly populated country; secondly, the unhealthy climate, which is deservedly shunned; thirdly, the scarcity of water, which at the close of the hot season occasionally fails *in toto*, and the neighbourhood is consequently partially deserted; building materials are also expensive, and have to be brought from a distance.
Tannah Church, repairs to the roof of.	- - Some of the timbers were discovered to be in a state of decay.	- Sanctioned 10 April 1845.	Tannah - - -	5,070 - -	5,070 - -	- - Completed in March 1846.	—
Toka: Construction of a new rafter, or decked double boat.	- - For crossing the Godavery River.	- - Sanctioned season 1845–46.	- - Toka on the Nagpoor dawk line.	2,434 - -	2,112 - -	- - Completed season 1845–46.	—

(continued)

No. 12.—Tabular Statement of the Principal Works executed by the Bombay Road and Tank Department, from 1836 to 1850–51 inclusive, and by the Bombay Engineers, &c.—*continued.*

NAME OF WORK.	Object of Construction.	Length, and Date of Commencement.	Place of Termination, or of Intended Termination.	Amount of Expense Incurred.	Estimated Amount for Completion.	Probable Time of Completion.	REMARKS.
				Rs. a. p.	*Rs. a. p.*		
Tannah: Construction of a new hospital.	For a detachment hospital	Sanctioned 12th March 1847.			4,340		56 ¾ feet in length, by 18 feet in breadth, with dispense rooms and out-offices.
Wurgaon Bundarrahs in the Ahmednuggur district.	For irrigation	These bundarrahs are three in number; sanctioned 1836–37.	In the Sunnur Pergunnah.	Two bundarrahs, 54 rupees.	236 The Gaom was to contribute 150 rupees, and a jagheerdar 100 rupees.		377 beegahs and four pauds are watered from these bunds, assisted by a few wells.
Wurrunder Ghaut to Mhar, constructing a bullock track over the.		Commenced 1850–51	Mhar		17,500 has been raised for the purpose of this work.		As a great part of the proposed line would pass through the Suchew Punt's territory, at a visit from Mr. Frere, the Punt expressed his willingness to subscribe a sum of 8,750 rupees; the Government granted a like sum.
Zeykheira Bundarrah, completing the, &c.	For purposes of irrigation			35,451 15 11		Completed season 1848–49.	The magnificent old bundarrah, which for some portion of its length is from 20 to 30 feet in height, and 10 feet thickness at top, has been raised and strongly coped for securing a larger supply of water in its rear. The water-course is carried over five miles of most difficult ground, and in its course is carried through three tunnels of considerable length; over three nullahs, by means of arched aqueducts; four nullahs are carried clear over it, and is crossed by roads in three places. The work thus completed affords a fine specimen of the application of the resources of the Engineer department to the restoration and improvement of an old work of irrigation. It is only to be hoped that a work on which upwards of 35,000 rupees have been expended by Government may not suffer injury from the notorious inattention of the villagers (in whose charge it now is) to the care of all permanent works on the line of their water-courses.

No. 13.

In the Printed Parliamentary Paper of the Honourable the House of Commons, No. 622 of 1851 (Pages 206 and 207), Statements have been given of the Expenditure incurred under the Presidency of Bombay, on Works of Irrigation, and in the Construction of Roads and Bridges, for the Ten Years from 1836-37 to 1845-46 inclusive. The following Statement exhibits the Amount of Expenditure reported by the Road and Tank Department, from its formation to the year 1850-51 inclusive; and in the Civil Branch by Superintending Engineers from 1845-46 to 1850-51 inclusive.

YEAR.	Road and Tank Department.	Civil Architect's Department.	By Superintending Engineer, Southern Provinces.	By Superintending Engineer, Northern Provinces.	By Superintending Engineer, Scinde.	By Civil Engineer, Candeish.	By Civil Engineer, Sattara.	TOTAL.
	Rs. a. p.	*Rs.* a. p.	*Rs.* a. p.	*Rs.* a. p.	*Rs.* a. p.	*Rs.* a. p.	*Rs.* a. p.	*Rs.* a. p.
Total expenditure to 30 June 1839 -	4,58,702 11 1	- - - -	- - - -	- - - -	- - -	- - -	- - - -	4,58,702 11 1
From 30th June 1839 to end of Season 1840-41 - -	2,70,815 14 -	- - - -	- - - -	- - - -	- - -	- - -	- - - -	2,70,815 14 -
Season 1841-42 -	1,76,118 - -	- - - -	- - - -	- - - -	- - -	- - -	- - - -	1,76,118 - -
Season 1842-43 -	1,24,914 14 2	- - - -	- - - -	- - - -	- - -	- - -	- - - -	1,24,914 14 2
Season 1843-44 -	1,27,814 6 -	- - - -	- - - -	- - - -	- - -	- - -	- - - -	1,27,814 6 -
Season 1844-45 -	1,27,044 7 -	- - - -	- - - -	- - - -	- - -	- - -	- - - -	1,27,044 7 -
Season 1845-46 -	No Report* - -	1,07,037 8 10	1,64,991 14 6	64,799 5 5	3,76,290 5 3	54,439 11 2	- - - -	10,82,354 10 5
Season 1846-47 -	3,14,795 13 3							
Season 1847-48 -	3,09,179 15 8	- - - -	- - - -	- - - -	- - -	- - -	- - - -	3,09,179 15 8
Season 1848-49 -	2,83,158 8 1	42,582 15 8	1,60,466 12 -	51,002 10 11	- - -	- - -	- - - -	5,37,210 14 8
Season 1849-50 -	3,53,788 1 7	33,316 11 2	1,56,957 - 3	35,855 13 9	- - -	58,000 9 -	42,205 15 8	6,80,124 3 5
Season 1850-51 -	3,61,893 4 4	59,315 10 2	3,99,559 11 5	43,293 10 7	4,619 13 6	- - -	2,25,314 13 4	10,93,996 15 4
Total Expenditure reported from the formation of the Road and Tank Department to the year 1850-51 inclusive -								49,88,276 15 9

* *Note.*—The practice of printing the Reports of the Superintending and Executive Engineers, in connexion with those of the Road and Tank Department, appears to have been first adopted in Season 1846-47, and to have originated from the plan proposed by the Chief Engineer and the Military Board in 1844, for the abolition of the Road and Tank Department.

SUMMARY.

SUMMARY of EXPENDITURE Incurred under the several PRESIDENCIES of *India*, as follows: viz.,

PRESIDENCY.	DESCRIPTION.	AMOUNT.
		Rs.
Bengal - - - - - -	- - Known expenditure on works under the general management of the Military Board, as per Preparatory Report, dated 8th September 1840 - -	1,39,64,099
Ditto - - - - - -	- - Amount expended from season 1839-40 to season 1850-51, inclusive - - - - - - -	2,85,04,891*
Fort St. George - - - -	- - On repair and construction of works of irrigation, and on roads, bridges and ghauts, from 1838 to 1850, inclusive -	1,25,56,293
Bombay - - - - -	- - Amount of expenditure reported by the Road and Tank Department, from its formation in 1836-37 to 1850-51, inclusive - - - -	49,88,277
	Rs.	6,00,13,560
The amount thus far expended under special grants (which exceed two crores) for the Ganges Canal, and for Works in the Punjab, has been about - -		1,00,00,000
	Making a Total, still exclusive of other items noted below, of - *Rs.*	7,00,13,560

While the total of ascertained expenditure, as above, amounts to the sum of 7,00,13,560 rupees in the aggregate, that sum cannot be considered as the total amount expended by Government on Works of public utility, the outlay incurred in public improvements under the control of Local Committees, from the proceeds of the One per Cent. Fund in the North-Western Provinces, from the Ferry Funds and from other sources, not being included, nor the value of convict labour employed on Public Works.

* Exclusive of Expenditure on the Godavery Annicut.

Considerable progress has been made in the several works alluded to at page 208 of the Printed Parliamentary Paper, No. 622 of 1851, for which special grants had been sanctioned, as will be seen from the Court's more recent despatches, given in Appendix No. 1.

Copies of Despatches to the Governments of the respective Presidencies on certain subjects which have of late engaged the attention of the Court of Directors, and a Memorandum on the Roorkee College, form Appendix No. 2.

APPENDIX.

Appendix No. 1.

Ganges Canal.

India Revenue Despatch, 21 December (No. 17) 1847.

Our Governor-General of India in Council.

Ganges Canal.

1. We have received two letters from our Governor-general, dated 3d and 20th September last (Nos. 16 and 17), transmitting further proceedings relative to the Ganges Canal, consequent on the receipt of our despatch of the 7th July (No. 9) 1847.

2. His Lordship had communicated extracts of that despatch to Major Baker, director of the canal, and to Lieutenant-colonel Abbott, Superintending Engineer in the North-Western Provinces, and now forwards copies of the observations which they have submitted to him.

3. Major Baker is of opinion that the estimate of 93 lacs, as given by Major Cautley, is not likely to be exceeded beyond the sum of four lacs, which he considers will be required to give greater strength to the works of the Solani Aqueduct. The period within which the whole work can be completed will be regulated by that occupied in the construction of the aqueduct, and he is confident that this may be accomplished within six years. Lieutenant-colonel Abbott confirms Major Baker's opinion with regard to the Solani Aqueduct, adding a recommendation for increasing the strength of some of the abutments, which it appears Major Baker had already effected by an alteration in Major Cautley's original plans.

4. With respect to the expediency of making the canal subservient to purposes of navigation, Major Baker estimates the total additional expense which will have to be incurred for that object, at 2,23,770 rupees. He says, "It has been shown in reports already before Government, that the navigation of the Ganges below Cawnpore will not be impaired by the abstraction of the canal supply at Hardwar, but that during a few months of the year some hinderance may occur in the higher course of the river. The inconvenience thus arising would be practically small, and is easily remediable by the substitution of a safe and expeditious route for the tedious, and often dangerous, passage now afforded by the river." Major Baker adds, "The sum of money which might be saved by leaving navigation entirely out of account, is thus seen to bear a small proportion to the whole estimate, and the additional expenditure of 2¼ lacs will be well bestowed on the provision of a navigable communication through the centre of the Doab, especially as the river steamers will be enabled to approach by the Jumna to the canal terminus, and there to deliver their freight at once into the canal boats."

5. Major Baker estimates the net revenue from the canal at 10 lacs, or 10 per cent. on the outlay, observing that "the rates of irrigation rent have been purposely fixed below the real value of the water, and therefore that the amount of direct revenue cannot be looked upon as a fair measure of the work of the canal."

6. The Governor-general informs us that he has applied to the President in Council for the services of Mr. Simms, the civil engineer, being of opinion that "it will be satisfactory to all parties that this gentleman should in person make an inspection of the Solani Aqueduct, assuming that his experience in this description of work justifies the reference."

7. We shall be glad to be furnished with Mr. Simms's opinion with regard to the Solani Aqueduct, and he may also be able to afford information respecting the suggestion of Lieutenant-colonel Abbott, for the construction of galvanic telegraphs on the line of the canal, "so that in case of accident at any part of the works the immense flow of water might be instantly stopped, and let off at the places prepared for its escape."

8. We trust that the Earl of Dalhousie will apply himself to the consideration of the question in all its bearings, with the same zeal and judgment which have been evinced by his predecessor in the Government of India.

We are, &c.

London, 21 December 1847. (signed) *H. S. G. Tucker.*
J. L. Lushington,
&c. &c.

India Revenue Despatch, 2 June (No. 11) 1852.

Our Governor-General of India in Council.

1. With his letter dated 28th July last (No. 1), our Governor-general has forwarded to us a revised estimate, prepared by Lieutenant-colonel Cautley, of the probable expense to be incurred in constructing the Ganges Canal works. His Lordship observes, that although the increase of cost which is contemplated in this estimate is undoubtedly large, he conceives that Lieutenant-colonel Cautley has satisfactorily accounted for it in the paper submitted by him to Government, and he accordingly trusts that we shall see cause to bestow our approval on what has already been done, and to give our sanction to the revised estimate now submitted.

2. The former estimate, as sanctioned in our despatch of the 7th July (No. 9) 1847, amounted to 93,39,746 rupees. In the estimate now before us the probable cost (including establishment and current repairs, which were omitted in the former one,) is given at 1,55,55,481 rupees. Of this sum the total amount actually expended up to the 30th April 1851 is stated to be 72,45,560 rupees.

3. This estimate has been prepared under instructions dated the 12th June 1850, addressed to Lieutenant-colonel Cautley by the Lieutenant-governor, who observed that it had occurred to him that sufficient progress had then been made in the construction of the Ganges Canal to enable a proximate estimate of its entire cost to be formed. "It is obvious," he remarked, "that in all great undertakings of this nature, the first estimate of the cost can only be a rough approximation towards the truth. It is impossible to foresee all the difficulties that arise from a new and large demand for labour and materials, which have hitherto been required only in small quantities or at places favourable for their production. It is also well known that during the progress of this, as of all other similarly large undertakings, important modifications of the original plan suggest themselves, which, though at first more expensive, add greatly to the stability and efficiency of the work, and will save future expense.

"But it is of importance that the earliest possible period should be seized for correcting the unavoidable errors of the first estimate, and for accurately appreciating the real expenditure involved in the undertaking. It is believed that

that this period has now arrived in the progress of your works on the Ganges Canal, and that you will find little difficulty in forming a revised estimate of the whole, which will be a near approximation to the truth."

4. The causes which have led to the increase in the estimated cost of the canal are given in detail in Lieutenant-colonel Cautley's report, and are briefly summed up as follows:

"There are three points which have greatly influenced the designs of the works now estimated for; viz.:

1st. "The results of the proceedings of a medical committee, which determined that the high-water mark of the canal should be kept as much as possible below the surface of the country.

2d. "The results of excavation in the upper division, showing that the supersoil only was clay, with an uninterrupted substratum of sand.

3d. "The change of design in the distribution of the supply below the 110th mile, which, in connexion with the results above referred to, have in fact led, with few exceptions, to the total reprojection, not only of the masonry works, but of the capacity of the canal channel.

"In referring, therefore, to the papers already printed, the present may rather be considered a fourth in succession to the three projects formerly submitted, than a revised estimate of what has gone before."

5. The excess of the revised over the original estimate is doubtless large, but considering that the latter was framed on data which were necessarily, to a great extent, imperfect or conjectural, we agree in the opinion expressed by the Governor-general, that Lieutenant-colonel Cautley has satisfactorily accounted for it. With full confidence, accordingly, in the zeal, ability, and high professional attainments of that distinguished officer, we give our sanction to the revised estimate now submitted to us, and we trust that every means will be taken for carrying on the construction of the canal with all practicable speed.

6. We take this opportunity of acknowledging the receipt of the letters and paragraphs referred to in the margin,* by which we have been kept informed of

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* India Revenue Letter, 26th June (No. 6) 1847, paras. 24, 25.
India Revenue Letter (Governor-general's), 6th December (No. 25) 1847, whole.
India Revenue Letter, 24th December (No. 21), whole.
Bengal Military Letter, 17th March (No. 36) 1848, p. 111 to 114.
Bengal Military Letter, 14th July (No. 110) 1848, p. 43 and 90.
India Public Letter, 14th August (No. 41) 1848, paras. 16 and 19.
India Revenue Letter (Governor-general's), 17th November (No. 4) 1849, whole.
Bengal Military Letter, 19th November (No. 185) 1850, p. 45, 46.
India Foreign Letter (Governor-general's), 26th February (No. 14) 1851, whole.
Bengal Military Letter, 26th September (No. 152) 1851, para. 38.
India Public Letter, 28th November (No. 37) 1851, para. 32.
Agra Revenue Narrative, 15th March (No. 1) 1847, paras. 12 to 46.
Agra Revenue Narrative, 12th May (No. 2) 1847, paras. 11 to 42.

Agra Revenue Narrative, dated—

29th June	(No. 3)	1847	p. 13 to 38	10th October	(No. 3)	1849	p. 17 to 38
15th October	(No. 4)	„	p. 8 to 47	26th December	(No. 4)	„	p. 23 to 42
20th December	(No. 5)	„	p. 22 to 52	27th April	(No. 1)	1850	p. 18 to 45
16th February	(No. 1)	1848	p. 14 to 38	15th June	(No. 2)	„	p. 21 to 59
30th May	(No. 2)	„	p. 15 to 46	16th September	(No. 3)	„	p. 23 to 61
24th October	(No. 3)	„	p. 22 to 70	13th November	(No. 4)	„	p. 21 to 51
30th December	(No. 4)	„	p. 41 to 85	11th April	(No. 1)	1851	p. 20 to 62
10th May	(No. 1)	1849	p. 22 to 53	29th July	(No. 2)	„	p. 28 to 66
9th July	(No. 2)	„	p. 18 to 43				

of the details of progress in the works of the Ganges Canal, and of other less important works of irrigation and drainage in the North-Western Provinces. It does not appear to us that they contain any particular points on which our observations are required, but we cannot pass them over without expressing our gratification at the evidence they offer of the zealous services rendered by the late and present Governors-general, no less than by the Lieutenant-governor, in the efficient prosecution of these important works, in which the best interests of the country are involved, and which has been ably and actively responded to by the officers of all grades attached to the Canal Department.

We are, &c.

London, 2 June 1852. (signed) *J. W. Hogg.*
R. Ellice,
&c. &c.

Roads in the Punjaub.

India Public Despatch, 4 August (No. 30) 1852.

Our Governor-General of India in Council.

Foreign letters from the Government of India, dated 7th December (No. 29) 1850, paras. 232 A, and 247; 7th March (No. 10) 1851, para. 190; 7th November (No. 34), para. 83.
Foreign letters from the Governor-general, dated 18th January (No. 4) 1851; 5th April (No. 26) 1851.

1. We now reply to the letters and paragraphs noted in the margin, relating to the construction of various lines of road in the Punjaub, the expense of which will be chargeable to the five lacs of rupees annually set apart under our sanction for public improvements in that territory.

2. The following are the works which, as here reported, have received your sanction: 1st. A fair-weather road from Lahore to Mooltan, the cost of which, at 200 rupees per mile for 224 miles, is estimated at 44,800 rupees. 2d. A road from Dera Ismael Khan to Shahpoor, a distance of 104 miles, the formation of which for ordinary traffic, with the necessary wells, is estimated to cost 3,000 rupees.

3d. A good but unmetalled road from Sheikapoora (between which place and Lahore a road was previously in course of construction) to meet the above road at Shahpoor, and thus complete the communication between Lahore and Dera Ismael Khan. The distance is 100 miles, and the estimated cost, including all expenses, is *Rs.* 21,651. 4.

4th. Two roads, from Mozuffurgurh, in the Khangurh district, one to Mooltan, a distance of 13 miles, and the other to Dera Ghazee Khan, a distance of 20 miles, at a cost of 1,000 rupees.

5th. The completion, as a second class road, of a line on which 20,000 rupees have already been expended, from Rawul Pindee to Kalabagh on the Indus; the distance is 107 miles, and the additional expenditure was estimated at 13,775 rupees.

3. All these lines of road are severally recommended by their greater or less importance in a military, a political, or a commercial point of view, and we approve the sanction given to their formation.

4. The most important work referred to in the letters under reply is, the proposed new road from Lahore to Peshawur, the formation of which was recognised in our despatch in the Revenue Department, dated the 5th December 1849, as a highly desirable object. The Governor-general has now forwarded to us plans and estimates for the construction of this road, to which he requests our sanction;

tion; and, pending the receipt of our orders, his Lordship has authorised the commencement of operations and an advance of 3,00,000 rupees for the needful preliminary expenses.

5. The proposed line has been carefully surveyed by Lieutenant Tayler, the executive officer, with the personal assistance, in some parts, of Lieutenant-colonel Napier; and while it adheres generally to the direction of the existing road, deviates from it in those places where a more favourable course could be selected. It is proposed that the road shall be of the width of 40 feet; that it shall be metalled throughout; that the numerous small rivers and nullahs shall be crossed by timber bridges; and that across the four great rivers, the Ravee, the Chenab, the Jelum, and the Indus, bridges of boats shall be thrown, which, in the case of the last, will be maintained throughout the year, while those over the other rivers will, during the rainy season, be disconnected, and the boats used for the purposes of a ferry.

6. The length of the road will be 275 miles, and the estimated cost, including the floating bridges and establishment and superintendence for two and a half years, is *Rs.* 15,48,841. 2.

7. We concur with the Governor-general in regarding the formation of an efficient road to Peshawur as a work not simply of importance, but of absolute necessity. It is most desirable for military purposes that the road should be passable at all seasons, and that there should be no danger of a stoppage at any point. On these grounds it is necessary that the road should be metalled, and that adequate means of crossing the great rivers on the line should be constantly kept up. We accordingly give our sanction to the entire scheme for the formation of the proposed road, which will join the grand trunk road at Lahore, and by means of which a direct line of communication will thus be opened between Calcutta and the extreme boundary of our territory on the north-west frontier.

8. The estimates submitted to us for this road are not of so detailed a character as is usually required, but they are stated to be "as near the truth as the most detailed estimate could be in the present knowledge of the resources of the country." The work will, of course, not be finally proceeded with till the fuller estimates called for by the Governor-general shall have been submitted for sanction.

9. We take this opportunity of repeating our orders that when sketch and survey maps accompany the estimates for roads submitted for sanction, a copy be invariably forwarded to us with the papers relating to the case.

We are, &c.

(signed) *J. W. Hogg.*
Russell Ellice,
&c. &c.

London, 4 August 1852.

Kurrachee Mole and Road.

Bombay Public Despatch, 11th August (No. 28) 1852.

Our Governor in Council at Bombay.

Para. 1. Your letter, dated the 16th February (No. 9) 1852, informs us with reference to our despatch No. 4 of 1851, that the Military Board has reported that the mole and road at Kurrachee can certainly be completed within the estimates; that, in their opinion, the exclusive attendance of an engineer officer

Further proceedings respecting the Mole and Road at Kurrachee.

is not necessary for the superintendence of the work, and that you have therefore authorised its completion, and have placed it under the superintendence of Captain Hill, providing that officer with an assistant to aid him in the performance of general duties as executive engineer in Lower Scinde.

2. These proceedings do not require any other notice than the expression of our approbation.

3. We are glad to observe that the Military Board has been directed to furnish quarterly reports of the progress of the works, by which your Government will be enabled to judge whether they are proceeding within the estimates.

4. With regard to the opinions of Lieutenant-colonel Scott and the Military Board respecting the probable effect of the mole on the Chinny Creek, we do not think it necessary at present to offer any remark.

We are, &c.

(signed) *J. W. Hogg.*
R. Ellice,
&c. &c.

London, 11 August 1852.

Appendix, No. 2.

Copy of Despatch to the Government of India,—Works on the Eastern Jumna Canal. The improvement and extension of Cochrane's Canal. The improvement of the Begaree Canal in Upper Scinde. Progress of the Hindoostan and Thibet Road.

Copy of Despatch to the Government of Fort St. George,—The construction of the Pennair Bridge and Annicut; the proposed construction of a Dam at Chetwye.

Copy of Despatch to the Government of Bombay,—Improvement of the roads in the Broach Collectorate.

Copy of Despatch to the Government of India,—Preparation of annual schemes for the construction of roads and bridges by the Governments of Fort St. George and Bombay.

Memorandum on the Roorkee College.

Eastern Jumna Canal.

India Revenue Despatch, 15th June (No. 11) 1853.

Our Governor-General of India in Council.

Para. 1. In your letter in the Home Department, dated the 11th March last (No. 16), you have submitted for our sanction a plan for remodelling the central division of the Eastern Jumna Canal, the estimated expense of which is *Rs.* 1,52,760. 5. 1.

2. The necessity which would ultimately arise for straightening the tortuous course of this portion of the canal has long been recognised by the officers employed on it, and the time seems now to have arrived when it is most desirable that the work should be commenced. The mode in which it is proposed to carry it out is clearly shown in the printed memorandum prepared by Lieutenant Morton, the superintendent of the Eastern Jumna Canal, and has received the entire approval of Lieutenant-colonel Cautley, of the Military Board, and of the Lieutenant-governor of the North-Western Provinces.

3. The main advantages which are anticipated from the work consist in greatly economising the water and facilitating its distribution for purposes of cultivation. In addition to this, the high embankments which now exist on this part of the canal, and which occasionally give way, and thereby cause much loss and injury, will be dispensed with, and the sanitary condition of the country near its banks, which now suffers materially from the swamps which are formed by the leakage of the water, will be largely improved.

4. We observe that Colonel Cautley states the clear profit to the Government from this canal, after allowing 5 per cent. interest on the receipts and disbursements, to have amounted on the 1st May 1852 to 97,595 rupees.

5. Under these circumstances we have no hesitation in acceding to your recommendation, and willingly accord our sanction to the expenditure proposed.

We are, &c.

(signed) *R. Ellice.*
J. Oliphant.

London, 13 June 1853.

Cochrane's Canal.

India Public Despatch, 31 March (No. 14) 1852.

Our Governor-General of India in Council.

Public Letter, dated 20 September (No. 36) 1850.

Cochrane's Canal.

Public letter (Public Works Department), dated 24th January (No. 2) 1849.

Revenue letter, 6th June (No. 30) 1850, para. 10; Revenue letter, 4th July (No. 33) 1851.

Para. 1. In this letter you request our orders on the measures proposed by the Madras Government for the improvement of Cochrane's Canal and for the extension of the line of canal communication through the Pulicat Lake to Doogoorauzepatam. The subject is placed more fully before us in the letters from the Government of Fort St. George, noted in the margin.

2. In our despatch to the Madras Government, dated 31 May (No. 12) 1848, we expressed our approval of the proposed expenditure of *Rs.*22,047. 7. 9. for the improvement of the water communication between Madras and Sooloorpet, by means of Cochrane's Canal. This portion of the work, it would appear, has not been carried into execution, in consequence of the wish of the Madras Government to give their previous consideration to the recommendation conveyed in our despatch of the 22d July 1846, in favour of Colonel de Havilland's proposition for the extension of the canal. As the work appears to be desirable, it is unnecessary here to do more than renew our sanction to its adoption.

3. The extension of the line of water communication to Doogoorauzepatam, at the northern extremity of the Pulicat Lake, was recommended by us to the consideration of the Madras Government in our despatch above referred to of the 22d July 1846. All the officers consulted appear to concur in opinion as to the practicability of this measure. It is proposed to carry it out by means of a channel, to be formed by a dredging machine in the bed of the Pulicat Lake, between Sooloorpett and Doogoorauzepatam, and the expense is estimated, after a careful survey by Captain de Butts, the executive engineer, at *Rs.* 47,274. 15.

4. We are willing to give our sanction to this expenditure, provided that you adhere to the opinion that the proposed measure will not only be of great advantage to the trade of the district, but will also lead to a considerable increase in the traffic and revenue of the existing canal.

5. As the work in question is intended to occupy two years in completion, a considerable time must elapse before it will be possible to judge of its results, but we desire to be kept duly informed of the proceedings of the Madras Government on the subject.

We are, &c.

(signed) *J. Sheppard.*
J. W. Hogg,
&c. &c.

London, 31 March 1852.

Begaree Canal.

India Revenue Despatch, 25 February (No. 3) 1852.

Our Governor-General of India in Council.

Begaree Canal.

Para. 1. In a letter dated the 26th of September last (No. 2), the Governor-general has solicited our favourable consideration of a project which had been submitted to him by the Government of Bombay, for widening and deepening the Begaree Canal in Upper Sinde. The cost of the work is estimated at 1,30,094 rupees, and the probable return at 1,19,000 rupees per annum. The canal flows partly through territory which belonged to Meer Ali Moorad, and it was proposed that that chief should be called on to defray a portion of the cost, but in the peculiar state of our relations with him, it was deemed unadvisable

advisable to enter into any negotiation on the subject. Under the decision communicated to you in our Political Despatch, dated the 24th September (No. 33) 1851, no difficulty will probably be found in making the needful arrangements, or perhaps in dispensing altogether with his co-operation.

2. The account given by Mr. Frere, in his letter of the 10th June 1851, of the greatly improved condition of that portion of Upper Sinde which is under the charge of Major Jacob (with whom the project under consideration originated), is highly satisfactory. Besides the anticipated increase of revenue, advantages of various kinds, tending to the prosperity of the people, to be expected from the execution of this work, are pointed out by the Commissioner, and we readily accord the sanction solicited.

3. We observe with satisfaction the praise bestowed by the Commissioner in Sinde, Mr. Frere, on Major Jacob, for the part he has taken in bringing this project to the notice of Government, and that that recommendation is fully concurred in by the Governor of Bombay.

4. We shall forward a copy of this despatch to the Government of Bombay.

We are, &c.

(signed) *J. Sheppard.*
J. W. Hogg,
&c. &c.

London, 25 February 1852.

Progress of the Hindoostan and Thibet Road.

Public Department, 18th May (No. 26) 1853.

Our Governor-General of India in Council.

Foreign Letter from, dated 7 December (No. 74) 1852.

With reference to paras. 16 to 19 of Public Despatch, dated 15 September (No. 35) 1852, transmit copy of a report, by Lieutenant Briggs, on the Hindoostan and Thibet Road, with the accompanying minute and correspondence, and solicit sanction to the further works required for the completion of the road, as well as to the construction of a branch road from Kussowlee to Buddee.

Para. 1. The plan for the construction of this road was regarded by us with great interest when it first came under our notice. Not only did we warmly approve the Governor-general's object of putting an end to the "Begaree system," by the formation of that portion of the line lying between Kalka and Simla, and look with interest to the political and commercial advantages likely to result from the opening of a line of communication with Thibet by way of Chini, but we regarded as highly important the solution of the question raised by Major Kennedy, when he laid out the line, viz., the possibility of constructing, through such a region as the Himalayas, a road which, while formed on correct and scientific principles, might yet be executed at a moderate cost.

2. The results, as exhibited in the highly interesting report of Lieutenant Briggs, must be considered to be eminently satisfactory, so far as the work has yet proceeded. "Within little more than two years," observes the Governor-general, "a road of more than 50 miles long, 12 feet broad, and with a ruling gradient of three in 100 feet (temporarily departed from in two places where it will hereafter be rectified), will have been constructed from the Plains to Simla. One half of the road from Simla to Chini, that is 70 miles in length and six feet in breadth, with the same ruling gradient of three feet in 100, has been constructed, and a tunnel of 200 yards in length has been excavated through solid rock. By the aid of the tribute labour due by the hill chiefs, the road of 12 feet in width has cost only 1,237 rupees a mile, and the road of six feet 690 rupees." The leading principle of Major Kennedy's plan, adherence to the ruling level, has thus, as more fully shown by Lieutenant Briggs, been departed from in two or three unimportant instances only; and though the former officer's sanguine expectations as to cost and rapidity of execution, have not perhaps been altogether realised, the experiment has been fully as successful in these respects as could have been expected, had the formidable nature of the country and the difficulty of procuring labour been more accurately known.

It appears desirable that this example of the successful working out of an important principle in road-making should be made generally known, and the printing of Lieutenant Briggs' report and its communication, not only to the officers of your Government, but also to the Governments of the other Presidencies, would seem to be the best means of accomplishing this object.

3. Additional works are still required on the Kalka and Simla road, at a cost of 10,000 rupees, in order to make it thoroughly complete, and 71 miles of the road between the latter place and Chini still remain to be finished, the cost of which will probably not exceed that of the completed portion. In addition to these works, Lieutenant Briggs proposed the formation of a branch road from Kussowlee to Buddee, at an estimated cost of 15,000 rupees, which would open a way from the Hill Stations to the Punjab, and the Governor-general is desirous that a branch road should be constructed from Dugshai to Subathoo, for the purpose of connecting all the stations in the hills with each other and with the plains. We give our cordial sanction to the expenditure required for the execution of these works.

4. We have, in conclusion, to express our concurrence in the commendations bestowed by the Governor-general on Lieutenant Briggs, the perusal of whose report has impressed us with a very high opinion of his general intelligence, as well as of his professional qualifications.

We are, &c.
(signed) *R. Ellice.*
J. Oliphant,
&c. &c.

London, 18 May 1853.

Pennair Bridge and Annicut.

Madras Revenue Despatch, 18th February (No. 2) 1852.

Our Governor in Council at Fort St. George.

Pennair Bridge and Annicut.

Para. 1. In a letter dated the 12th August last (No. 10), the Government of India have submitted for our favourable consideration a project laid before them by your Government for the construction of an annicut (to serve likewise as a bridge) across the Pennair River, in the Nellore district, at a cost of *Rs.* 85,547. 4. 6.

2. This work is intended to secure and extend the cultivation of a large tract of country. It is stated that on the average of the last five years, land bearing an assessment of 13,094 rupees has been annually abandoned, solely from the want of water to irrigate it. This amount would be at once secured by the execution of the proposed work; but it is further confidently anticipated that by increased cultivation, the ultimate gain to the revenue would not fall short of 20,000 rupees.

3. Relying on the correctness of your estimates, both of expenditure and return, we accord the sanction solicited by you and by the Government of India. Although in authorising expenditure on works of this description, we of course look to the direct return which they are calculated to produce in the shape of an increase to the land revenue, we are also mainly influenced by a consideration of the great advantages which they afford to the cultivators by extending the field of their labour, securing to them its fruits, and adding to its productiveness.

We are, &c.
(signed) *J. Sheppard.*
J. W. Hogg,
&c. &c.

London, 18 February 1853.

Chetwye Dam.

Madras Revenue Despatch, 15th December (No. 19) 1852.

Our Governor in Council at Fort St. George.

Chetwye Dam. Letters dated 10th September (No. 53) 1851; 25th June (No. 30) 1852.

Para. 1. We now reply to your letters of the dates noted in the margin, forwarding for our sanction a proposal of Major Cotton to construct a dam at Chetwye, in lieu of that which failed at Yennamaikal, in the district of Malabar.

2. Chetwye is some miles further down the stream than Yennamaikal, and before finally determining on the new site, the question seems to have received a very careful investigation, and no effort seems to have been spared to arrive at an accurate view of the comparative advantages of the former and proposed position of the dam. The discussion which preceded the decision of the question being of an exclusively professional character, it is not our intention to enter into a review of it. It is sufficient to observe in this place, that Major Cotton appears not only to have effectually disposed of the objections which were urged against the work so far as to carry the opinion of his official superiors with him, but to have obtained the acquiescence of his opponents in the correctness of his views.

3. We observe also that the opposition originally offered by the Cochin Sirkar to the removal of the bund from Yennamaikal to Chetwye was based on an erroneous view of the subject, and was subsequently withdrawn.

4. In a financial point of view, the proposal of Major Cotton appears to possess many great advantages. The expense of restoring the dam at Yennamaikul is estimated at *Rs.* 34,814. 13., and that of constructing a new dam at that place at *Rs.* 74,214. 4.; while the total expense of a dam at Chetwye is estimated at *Rs.* 36,215. 14. The revenue derived from the bund at Yennamaikul is 2,500 rupees per annum, and the annual revenue to be expected from the erection of the bund at Chetwye is, at the lowest estimate, 7,500 rupees. If, therefore, the cost of erecting a bund, and the return to be expected from it at these two positions, be compared, it appears on a rough computation that the work might be executed at Chetwye at half the cost, while the return would be trebled, showing a return of 3 ¼ per cent.* on the outlay in one case, and of 21 per cent. in the other.

* Cost.	Return.	Return.
Rs.	*Rs.*	*Dec.* *Rs.* *a.* *p.*
74,000	2,500	3·24 or 3 3 11
36,000	7,500	20·83 or 20 13 4

5. Relying, therefore, on the accuracy of the information and estimates submitted to us, we have no hesitation in according our sanction to Major Cotton's proposal.

6. You solicit our orders on another question in connexion with this work, viz., the portion of expense that the Cochin Government should bear in its construction and subsequent maintenance in repair. As the Cochin State will participate in the benefits accruing from the work, it seems but reasonable that that State should contribute towards the expense of constructing it. But the dewan of Cochin, and the Resident, Major-general Cullen, object to such contribution, the former on general grounds, and the latter on the ground that the Cochin Government was in no way responsible for the failure of the bund, and is in consequence of its poverty entitled to liberal consideration. The force of these objections is recognised by your President, while Mr. Thomas does not wholly concur in them.

7. Under all the circumstances of the case, we are disposed to concur in the opinion expressed by your President in his minute, dated 12th June 1852, that the Cochin Durbar having intimated its readiness "to contribute to the preservation of the dam so soon as it shall be built, this is as much as ought to be required."

We are, &c.

London, 15 December 1852. (signed) *J. W. Hogg.*
R. Ellice,
&c. &c.

Repair of Roads in the Broach Collectorate.

Extract Public Letter to Bombay, dated 29th June (No. 22) 1853.

Letter from, dated 15th February (No. 13) 1851.

(Paras. 24, 25; also letter dated 27th January (No. 5) 1852, p. 28.)

Expenditure of 2,000 rupees, out of certain fines imposed on account of the adulteration of cotton, on the repair of roads in the Broach Collectorate, sanctioned, in addition to 1,000 rupees from the annual repair fund, which it was intended to appropriate to the object. An estimate was subsequently sanctioned for the construction, at a cost of 879 rupees, of a causeway over the Dhadur Creek, which had long been a serious obstacle to the traffic between the different parts of the Broach Collectorate. The causeway was to be made by driving in two rows of piles across the river, at the distance of 12 feet apart, the inner sides being boarded with coarse planks, and the centre being filled in with stones and rubbish, which would form the roadway.

Para. 30. It appears to be the decided opinion of Mr. Davies, the Collector, that no expensive measures for the improvement of the roads in the Broach Collectorate are required, and that the removal of the obstacles, arising principally from their narrowness, which at present impede traffic on "the rough though practicable roads," by which the district is intersected in "all directions," may be accomplished without much difficulty. It is highly satisfactory that Mr. Davies finds the inhabitants ready to assist him in these works, and that he expects to be able to carry out his objects as regards the improvement of the roads, without the aid of the engineers' department.

31. The want of the means of crossing the numerous streams within the collectorate, appears far more pressing than even that of the repair of the roads, and should receive your early attention. The simple method employed at the Dadur Creek, where it is crossed by the road leading to the port of Tunkaria, may, if successful there, be applicable probably to other places of the same character; but we are desirous of learning whether the suggestion of Mr. Davies to Captain Goodfellow for the construction of "a strong, simple, wooden bridge" over the Kharree, between Khutpoor Sumlee and Hansote, and which he thought might serve as a model for others, if it should be found to answer, has yet been acted on.

32. We observe that, in this instance, the Collector of Broach, finding the amount assigned for the repair of the roads in his district insufficient, applied for an additional amount (2,000 rupees) out of the sums realised from fines levied under a recent law upon persons guilty of the offence of adulterating cotton. You are aware of our objection to any special appropriation of assets of this description to local purposes, but we should have entirely approved of your having sanctioned the additional grant out of the general revenues for an object of public benefit, such as that in question.

Public Department, 24th May (No. 32) 1853.

Our Governor-General of India in Council.

Preparation of annual schemes for the construction of roads and bridges by the Governments of Fort St. George and Bombay.

1. We have been anxiously awaiting the result of the inquiries which, in accordance with our orders of the 30th January 1850, have been instituted by the Governments of Fort St. George and Bombay, with regard to the superintendence and execution of public works at those Presidencies.

2. In our consideration of the proceedings of the above-named Governments with regard to various proposed works of public improvement, and especially in the case of roads, we have often, and in that despatch especially, noticed the irregular and unsystematic manner in which the plans laid before them have been disposed of. The sanction given to the several schemes by the local governments, or the recommendations made to your Government in favour of them, appear to have been grounded too frequently on considerations limited to each particular project, and having no reference to the general wants of the country. The natural consequence of such a mode of proceeding, as regards roads, has been that large expenditure has not unfrequently been incurred on lines of inferior importance, while the trunk lines have remained in an imperfect state, on the ground that the necessary funds could not be spared to complete them.

3. In

3. In the despatch above referred to, we showed ourselves strongly impressed with the evils arising from so imperfect and inadequate a mode of considering the subject, and referred to your consideration not only the best mode of departmental management to be adopted with regard to public works, but also the importance of taking into view all such works, and especially trunk and branch roads, as portions of one connected system. While we shall await the information referred to in the first paragraph of this despatch, before entering on a consideration of the general subject, we are desirous that no time should be lost in applying a remedy for the particular evil we have pointed out.

4. It is our opinion that the object in view may best be attained by the adoption of a plan of the following description. Each of the local governments should require, annually, from the officers who, in the respective Presidencies, may be vested with the general charge of the roads, a statement of the new works most urgently required for the purposes of inter-communication, and the execution of which, within the ensuing year, he may be prepared to undertake. On receiving this statement, it would be the duty of the Government to decide, after a careful consideration of the circumstances of the Presidency at the time, whether the works proposed had been properly selected, in preference to others, for immediate execution; and having come to a conclusion on this point, the whole scheme involving the proposed expenditure on new roads and bridges for the coming year, should be submitted for your final sanction and approval.

5. The plan above indicated, though peculiarly required with reference to the means of internal communication, ought also to be applied to public works of every description; and believing that much benefit would arise from the means it would afford of bringing annually under review the wants of each Presidency, as regards buildings, works of irrigation, and other works of a miscellaneous character, we direct that its operations be extended accordingly. It is desirable that, with respect to these works, as in the case of roads, the statements should exhibit the entire expenditure proposed to be incurred on new works, whatever may be the amount of the estimate for each; and we forward to you a number in the packet, a copy of the Ordnance Estimate, as annually laid before Parliament. You will find in that portion of them which relates to the public works, the form giving the estimated expense of new works, and the past as well as probable expense of those in progress, and we should recommend that this form should be adopted so far as it is applicable to the circumstances in India.

6. We wish it to be distinctly understood, that in issuing these orders, it is far from our desire either to place any further restriction on the amount heretofore expended on works of public improvement, or to deprive the Governments of Fort St. George and Bombay of any of the power they have hitherto possessed of authorising expenditure on such works. Our object is primarily to secure the application of the money to be expended in such a way as to produce the greatest possible benefit to the country and to the community; but the proposed plan, while preserving to your government that general control over the finances of India, which it is intended that you should possess, will have the advantage of relieving your government from that unnecessary distraction of attention and waste of time, which arise from a number of separate projects, relating to objects of a kindred nature, being brought under your consideration at different periods.

We are, &c.
(signed) *R. Ellice.*
J. Oliphant,
&c. &c.

London, 24 May 1853.

Memorandum on the Roorkee College.

For years there had existed a large demand for skill in every branch of civil engineering, to supply which efforts were for some time made by providing the means of special training in institutions which were then existing. In January 1845, Lieutenant Baird Smith, of the Engineers, superintendent of the Eastern Jumna Canal, undertook to conduct, at Saharunpoor, the education and train-

ing of native youths in civil engineering; and two of the most advanced scholars in the Agra and Delhi Colleges were placed under Lieutenant Smith's care. Towards the close of the same year masters were appointed to the Delhi and Agra Colleges for the special purpose of teaching architectural drawing and surveying; a class of "sub-assistant engineers" was also formed, with fixed allowances and a recognised standing in the public service.

The number of sub-assistant executive engineers was at first limited to four, but was subsequently (22d December 1846) increased to 20. One of Lieutenant Baird Smith's pupils, named Mannoo Lall, was immediately examined, and found qualified for an appointment of this nature; he has since rendered valuable services as a teacher in the Roorkee College. Three other native youths passed the required examination and obtained appointments as sub-assistant executive engineers. The chief benefit of the measure had been, to hold out definite expectations to the educated youth in the Government colleges. The standard of mathematical attainments had been designedly fixed high, and there were many who were making great exertions to reach the mark.

In 1847 Lord Hardinge determined on the vigorous prosecution of the Ganges Canal. The science that was necessary to construct a work of this magnitude would also be constantly kept in exercise for its maintenance, improvement and extension; immediate measures were necessary to meet the emergency, and to provide a constant supply of well-trained, experienced civil engineers. Out of this emergency Roorkee College had its rise.

The proposal for its institution obtained the immediate and cordial support of the Governor-general of India. On October 19th, 1847, Lieutenant R. Maclagan, of the Bengal Engineers, was appointed principal of the college, and on November 25th of the same year the Prospectus was issued:—

No. 949.

General Department, North-Western Provinces. Head Quarters, the 25th November 1847.

NOTIFICATION.

"The Lieutenant-governor directs the publication, for general information, of the following* Prospectus of a college for instruction in civil engineering, which is now established at Roorkee, and of which Lieutenant R. Maclagan, Engineers, has been appointed principal."

* *See* Report printed by order of the Honourable the Lieut.-Governor of the North-Western Provinces, 1851.

It was reported in 1851 that, though little more than three years have passed since the first opening of the college, and during part of that time the exigencies of the public service in the Punjab war caused a temporary suspension of operations, yet a considerable number of well-trained men had been furnished to the service of the state, and the institution had obtained a standing and organization which afforded promise of much future usefulness.

The following measures were proposed, in 1851, for the further development of the scheme which was contemplated in the first design of the institution; viz.,—

1st. The admission of officers, both of the Royal and East India Company's armies, to study at Roorkee College.

2d. The improvement and superintendence of the village schools in a circle of 40 or 50 miles round Roorkee.

3d. The establishment, in connexion with the college, of a depôt of mathematical and scientific instruments, and of a workshop for their manufacture and repair.

4th. The formation of a museum of economic geology.

5th. The erection of an observatory for instruction.

6th. The maintenance of metal and stone printing presses, with a bookbinder's establishment, and all that is necessary for the publication of scientific works, with appropriate drawings and illustrations.

7th. The

7th. The enlargement of the college building and establishment to meet all the purposes.

The applications for admission into the several departments of the college had been very great.

The following are Extracts from the Court's Despatches on the subject of the College.

EXTRACT Public Letter to India, dated 28 March (No. 6) 1849.

Para. 2. WE concur in the view taken by the Lieutenant-governor of the North-Western Provinces, of the advantages which may reasonably be expected from an institution of this nature, and we therefore approve of its establishment.

EXTRACT Public Letter to India, dated 2 June (No. 23) 1852.

Para. 7. WE accordingly give our sanction to the expenditure which will be necessary to carry out the plan of the Lieutenant-governor.

8. While we have been mainly influenced in authorising this large outlay by the considerations placed before us by the Lieutenant-governor, arising from the advantages to the public service, and the general benefits to the people which may be expected from placing the college on a thoroughly efficient footing, we hail with much satisfaction the means which the institution, on its extended plan, will afford to the native youth of qualifying themselves for the service of Government in a way which is, to a great extent, new to them, but for which, so far as they have been tried, they have manifested a perfect aptitude.

EXTRACT Public Letter to India, dated 14 July (No. 27) 1852.

68. WE notice with much satisfaction the additional evidence afforded in these papers of the successful working of this important institution, and we approve the measures which you have sanctioned for the further extension of its usefulness.

Letter from, dated 21 December (No. 47) 1850.

(7 to 9.) The establishment of a class in the Roorkee College for imparting the rudiments of civil engineering in the vernacular language having proved very successful, the number of the class increased from 16 to 24. At the same time, the allowance of one-third of the whole number was fixed at 10 rupees instead of 5 rupees per mensem, and as it was thought desirable to encourage the resort to the college of youths from the Punjab, sanction was given for the payment of travelling allowance to a limited number of young men from Lahore.

(True copies.)

(signed) *T. L. Peacock,*
Examiner of India Correspondence.

East India House,
17 August 1853.

A RETURN of all Sums spent on Public Works (not of a Military kind) in *India*, since April 1834, keeping distinct the Amounts spent on the Repairs of Old, and on the Construction of New Works, together with the Objects of the Works newly Constructed; and stating, when remunerative, the Amounts received from such Works.

(*Mr. Bright.*)

Ordered, by The House of Commons, *to be Printed,*
20 *August* 1853.

[*Price* 1*s.* 10*d.*]

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